WAKE TECH COMMUNITY COLLEGE

TECHNOLOGY 4.0 BUILDING

12/20/2023

BID SET

VOLUME 1

LORD AECK SARGENT

WAKE TECH COMMUNITY COLLEGE

TECHNOLOGY 4.0 BUILDING

12/20/2023

BID SET

DESIGN TEAM:

Architecture
Lord Aeck Sargent

Civil Engineering
McAdams

Landscape Architecture
Surface678

Structural Engineering
Lynch Mykins

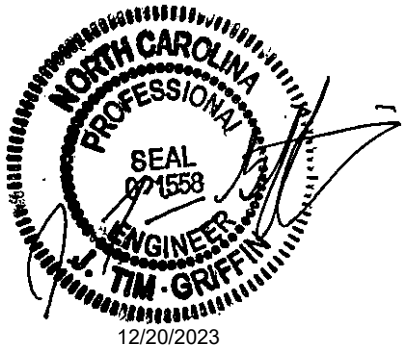
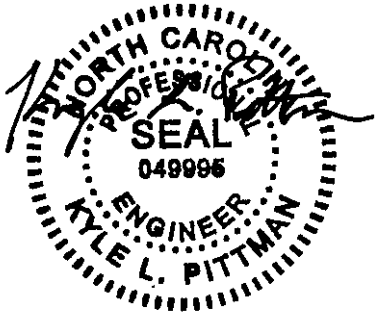
MEP / FP Engineering
RMF Engineering

RMF Engineering
Reliability. Efficiency. Integrity.

Audio / Visual Design
BrightTree Studios

Acoustics
Thorburn Associates

SECTION 00 01 07 - SEALS PAGE

ARCHITECTURAL  	**CIVIL** 
LANDSCAPE  	**STRUCTURAL** 
FIRE PROTECTION, PLUMBING, & MECHANICAL  	**ELECTRICAL, AUDIOVISUAL, SECURITY, & FIRE ALARM** 

END OF SECTION

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Wake Technical Community College
Bid #130-WTCC

Department/Agency	Wake Technical Community College
Project Name	Technology 4.0 Building
Services	Single Prime Construction
Scope	The project is comprised of a three-story, 79,000 GSF Technology 4.0 Building at the new Wake Tech East Site in Wendell, NC. The building includes flexible teaching labs, high-bay training spaces, maker spaces, technology labs, computer labs and general classrooms to support programs in Mechanical Engineering; Advanced Electronics; Microelectronics; Mechatronics; Biopharmaceuticals; Robotics Automation; and Unmanned Aircraft Operations & Repair. The facility and its systems will serve as a teaching tool, integrating technologies that students can manipulate and learn from. The project is slated for a 2-globe rating from USGBI Green Globes.
Contact	Lord, Aeck & Sargent - Kelly Yates, AIA Principal Wake Tech - Gabriel Hoskins, Project Manager
Telephone	(919) 913-2671 (919) 866-5602
Email	kelly.yates@lordaecksargent.com gbhoskins@waketech.edu
Construction Estimate	$42,500,000.00
Source of Funds	Wake County Bonds
NCCCS #	2535
Pre-Bid Meeting	1:00 p.m. Tuesday, February 20th, 2024 5401 Rolesville Road, Wendell NC – Building A – Central Energy Plant
Publish Date	Friday, February 9th, 2024
All Clarification Questions Due	2:00 p.m. Wednesday, February 28th, 2024
Closing Date	2:00 p.m. Thursday, March 28th, 2024
Submit Bids To:	Gabriel Hoskins, Project Manager Wake Technical Community College 4723Advantage Way Building T, Suite 201 Raleigh, NC 27603-5696

CONTRACT DOCUMENTS AND PLANS

Complete plans, specifications and contract documents will be available in the following planrooms:
Construction Connect - https://projects.constructconnect.com/
Dodge - https://planroom.construction.com/
NC IMED - https://theinstitutenc.org/calendar/category/bid-opportunities/
And available from the Designer via digital file transfer (email request to kelly.yates@lordaecksargent.com).

BID SUBMITTAL CRITERIA

Detailed information on the bid submittal requirements are indicated in the bid documents. Sealed proposals will be received by Wake Technical Community College in Raleigh, NC, in Conference Room 200A, Building T Wake Technical Community College, Southern Wake Campus, 4723 Advantage Way, Raleigh, NC 27603, up to 2:00 p.m. on Thursday March 28th, 2024.

To be considered, only bids from the following prequalified firms will be accepted: Barr & Barr, Inc.; Batson-Cook Company; Frank L. Blum Construction; Bobbitt Construction, Inc.; Brasfield & Gorrie, LLC; CIC Construction Group USA, LLC; Clancy & Theys Construction Company; Consigli Construction Co., Inc.; Daniels & Daniels Construction Company, Inc.; JM Thompson Company; Messer Construction Co.; Monteith Construction Corp.; New Atlantic Contracting, Inc.; The Robbins & Morton Group; Shelco, LLC; T. A. Loving Company; W. M. Jordan Company, Inc.; The Whiting-Turner Contracting Company.

Wake Technical Community College encourages participation by MWBE firms and supports efforts to ensure and promote opportunities for minority businesses.

SECTION 00 30 00 - INFORMATION AVAILABLE TO BIDDERS

EXISTING REPORTS AND SURVEYS

1.01 SUBSURFACE INVESTIGATION REPORT

A. A copy of a geotechnical report with respect to the building site is:
   1. Title: Geotechnical Exploration Report, WTCC East Wake Technology 4.0 Building
   2. Date: November 22, 2022
   3. Prepared by: S&ME, Inc.
   4. A copy of the report is bound into the Project Manual immediately following this document.

B. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.

C. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

D. The Contractor is entitled to rely upon the factual information contained therein, such as locations and depths of tests or explorations made at the site and material encountered at each location, all as of the dates made. The Contractor is not entitled to rely upon the nonfactual information contained therein such as interpretations, opinions, or extrapolations of data; nor is the Contractor entitled to rely upon the completeness of the information for the Contractor's purposes.

E. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

END OF SECTION

Geotechnical Exploration Report
WTCC East Wake Technology 4.0 Building
Wendell, North Carolina
S&ME Project No. 22050739

PREPARED FOR:

Wake Technical Community College
9101 Fayetteville Road
Raleigh, North Carolina 27603

PREPARED BY:

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

November 22, 2022

November 22, 2022

Wake Technical Community College
9101 Fayetteville Road
Raleigh, North Carolina 27603

Attention: Jefferey Carter, P.E.
Vice President

Reference: **Geotechnical Exploration Report**
WTCC East Wake Technology 4.0 Building
Wendell, North Carolina
S&ME Project No. 22050739
NC PE Firm License No. F-0176

Dear Mr. Carter:

S&ME, Inc. is pleased to submit this geotechnical exploration report for the referenced project. This report presents our understanding of the project, description of our field exploration, discussion of encountered subsurface conditions, and our geotechnical recommendations. Our services were performed in general accordance with our proposal number 22050739 dated October 19, 2022. A Boring Location Plan, Generalized Subsurface Conditions Profile, Boring Logs and Laboratory Test Results are included in the Appendix.

S&ME appreciates the opportunity to provide our professional engineering services on this project. Should you have any questions concerning this report or if we may be of further assistance, please contact us at your convenience.

Sincerely,

S&ME, Inc.

William Harrison
Geotechnical Staff Professional

NORTH CAROLINA PROFESSIONAL SEAL 052980 ENGINEER ELLIOT G. BLONSHINE

Elliot Blonshine
Nov 22 2022 3:59 PM

Elliot Blonshine, P.E.
Geotechnical Group Leader
NC License No. 052980

Senior Reviewed by Wes Lowder, P.E.

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Appendices

1.0 Project Information and Site Description

This report is based on the following information:

- Email correspondence between you and Elliot Blonshine from August 22 to September 27, 2022, which requested S&ME to perform soil test borings and seasonal high water table evaluations for the Technology 4.0 Building.
- Previous geotechnical explorations by S&ME for the East Wake Campus including
  - Central Energy Plant building
  - General site infrastructure including pavements, utilities, and ponds
  - South Loop Road
  - General Education Building and pavements
- Site grading plans provided to S&ME during previous geotechnical services for this project.

The Technology 4.0 Building will be in the east-central portion of the East Wake Site development. At the time of our site reconnaissance, the area consisted of a relatively flat area that appeared to have been graded during recent construction. Based on our observations and the site grading plan, it appears that only 1-3 feet of fill was placed. A gravel construction roadway extends through the southeastern corner of the proposed building. On the north side of the construction roadway, a drainage swale was constructed with rip rap check dams, generally in the southeastern portion of the building footprint. At the time of our site visit, the drainage swale was dry. Some utilities have been installed in the vicinity of the proposed building footprint, including electrical cables, street lighting, and sanitary sewer manholes. Parking lot and concrete curb have been constructed immediately north of the building footprint.

We understand the Technology 4.0 Building will have a plan footprint of about 25,000 square feet. We understand a finished floor elevation (FFE) of 312 feet is planned throughout the majority of the building, except for the northeastern corner which has a planned FFE of 307. Based on site grading plans (sheet CG112) prepared by SEPI and dated June 16, 2021, existing site elevations range from about 306 to 314 feet. Site grading to achieve the proposed finish floor elevation will require maximum fill depths of about 5 feet, and maximum cut depths of about 2 feet. Our understanding of existing site grades should be reviewed and confirmed by others.

Anticipated maximum column loads of 475 kips have been provided. Based on our understanding of planned building construction, we have assumed maximum wall and slab loads of 10 kips per linear foot and 150 pounds per square foot, respectively. Structural loading assumptions should be reviewed and confirmed by others.

2.0 Regional Geology

The site is located within the Raleigh Belt Region of the Piedmont Physiographic Province. Parent rock materials in the area of the site primarily consist of metamorphosed granite, gneiss, and schist. Within upland areas, natural soils within the Piedmont Province are the residual product of chemical and physical weathering of parent rock materials. The typical residual profile consists of finer grained silts and clays near the surface, which gradually transition to coarser and denser material with depth. In many locations, the transitional zone between soil and

rock is not well defined. Locally, the transitional zone is termed partially weathered rock (PWR). For engineering purposes, partially weathered rock is considered as residual material in which standard penetration test N-values exceed 100 blows per foot.

More specifically, the site is underlain by a geologic formation known as the Rolesville Batholith which is a 50-mile long by 15-mile wide granitic pluton. The area is known for shallow granitic rock and large boulders. Overburden soils can consist of plastic silty clays, sandy clays, silty sands, and sandy silts. Perched water can sometimes exist where sandy soils overlie clayey soils or shallow rock.

3.0 Field Exploration

Our subsurface exploration included a visual site reconnaissance and performance of eight soil test borings. Borings T-1 through T-8 were performed at approximate locations shown on Figure 1 in Appendix I.

Soil test borings were performed using an ATV-mounted, Diedrich D-50 drill rig, using 3¼-inch hollow-stem augers. Split-spoon samples of subsurface soils were taken at approximate 2½-foot intervals to a depth of 10 feet and 5-feet intervals thereafter. Standard penetration tests were conducted in conjunction with split-spoon sampling in general accordance with ASTM D 1586. The drill rig was equipped with an automatic hammer.

Boreholes were observed for groundwater at completion of drilling, and again after a period of approximately 24 hours in select borings. Boreholes were backfilled with auger cuttings and a hole closure device.

A Generalized Subsurface Conditions profile (Figure 2), along with Boring Log records are included in the Appendix. Stratification lines shown on the Boring Logs and Profile are intended to represent approximate depths of changes in soil types. Naturally, transitional changes in soil types are often gradual and cannot be defined at certain depths. Ground surface elevations shown were estimated from topographic information presented on the Site Grading Plan (sheet CG112) prepared by SEPI (dated June 16, 2021) and should be considered approximate.

Representative split-spoon samples were returned to our laboratory for visual classification and testing. Soils were classified in general accordance with Unified Soil Classification System guidelines. Laboratory testing included natural moisture content, Atterberg limits, and grain size testing for general classification purposes. Laboratory testing was performed in general accordance with applicable ASTM standards.

4.0 Subsurface Conditions

4.1 Fill Materials

A surficial layer of fill soil, ranging from 1 to 3 feet in depth, was encountered at boring locations T-2, T-5, T-7 and T-8. Fill soils were generally classified as silty sands (USCS Classification SM) and low plasticity sandy (CL). Fill material in the upper 3 feet of boring T-8 was dark in color and contained small wood pieces and an organic odor. SPT N-Values within fill soils ranged from 4 to 19 blows per foot (bpf). Typically, well compacted fill exhibits SPT N-values of 8 bpf or greater. Fill soils found at boring T-8 were generally poorly compacted and were moist to wet.

4.2 Residual Soils

Residual (weathered-in-place) soils were encountered at the ground surface in borings T-1, T-3, T-4, and T-6, and beneath fill soils in borings T-2, T-5, T-7, and T-8. Residual soils encountered consisted of silty and clayey sands (SM and SC) and sandy silt (ML). SPT N-values within residual soils ranged from 4 to 54 blows per foot (bpf). These values indicate very loose to very dense relative densities for sands and stiff to very stiff consistencies for the silts. Lower consistency soils were found at boring T-3. Split-spoon soil samples were observed as moist to wet. Partially Weathered Rock and Auger Refusal Material

Partially weathered rock (PWR) was encountered within all borings except T-2. PWR was encountered at depths ranging from about ground surface to 24 feet below the existing ground surface. PWR is defined as material exhibiting SPT N-values of greater than 100 blows per foot (50 blows per 6 inches). The PWR was sampled as silty sand. Standard penetration test values in partially weathered rock ranged from 50 blows with 6 inches of penetration (50/6″) to 50 blows with 1 inch of penetration (50/1″). Partially weathered rock materials were generally observed as moist to wet.

Auger refusal materials were encountered in all borings at depths ranging from approximately 7½ to 27 feet below existing ground surface. Auger refusal may be indicative of less weathered PWR, boulders, or the top of parent rock. Approximate depths to PWR and auger refusal are shown in Table 4-1 below.

Table 4-1 – Approximate Depths to PWR and Auger Refusal

Boring	Approximate Depth to PWR (feet)	Approximate Depth to Auger Refusal (feet)
T-1	Lens from 0 – 3 feet 6 ½	13
T-2	--	16 ½
T-3	8	9
T-4	9 ½	11 ½
T-5	19	20
T-6	9 ½	11
T-7	6	7 ½
T-8	24	27

-- Not Encountered

4.3 Groundwater

Groundwater measurements were attempted at termination of drilling and about 24 hours after drilling in select borings. Groundwater was encountered in borings T-2, T-5 and T-8 at depths ranging from about 15 to 19 feet below ground surface. The remaining borings were observed to be dry above their cave depths which ranged from 6 to 10 ½ feet below ground surface.

Perched water conditions are known to exist in this geologic setting during the typically wetter winter months above less permeable fine-grained soils and at the interface between overburden soils and partially weathered rock. Additionally, groundwater depths can be expected to fluctuate due to seasonal variations in rainfall, evaporation, and other factors. The installation of piezometers and periodic water level readings over a period of time are required to estimate more accurate water level depths.

5.0 Laboratory Test Results

A summary of laboratory test results is presented in the table below. Individual laboratory test results are included in Appendix III.

Table 5-1 Summary of Laboratory Test Results

Boring No.	Sample Depth (ft)	Natural Moisture Content (%)	Atterberg Limits		Grain Size Analysis		USCS
			Liquid Limit	Plasticity Index	Percent Sand	Percent Fines (Passing #200 Sieve)	
T-3	1 – 2.5	14.8	--	--	67.8	32.2	SM
T-3	3.5 – 5	5.8	--	--	85.8	14.2	SM
T-8	1 – 2.5	16.0	23	10	--	--	CL
T-8	3.5 – 5	11.1	--	--	41.1	38.9	SC

-- Not Tested

6.0 Conclusions and Recommendations

The following recommendations are based upon review of the exploration data, our understanding of the planned development, our engineering analyses, and experience with similar projects and subsurface conditions. If our assumptions of structural loads or site grading are significantly different from those presented, we request the opportunity to review and comment upon the recommendations of this report so that they may be confirmed, extended, or modified as necessary.

6.1 General Discussion

Based on our understanding of project development plans and geotechnical analyses of field and laboratory testing data, it is our opinion that this site is adaptable for the planned development provided that site preparation recommendations presented herein are implemented during construction.

The brief summary presented below should not be used for design or construction purposes without reviewing more detailed information in this report. Geotechnical considerations for this site include the following:

- **Existing Fill Soils –** Fill soils were poorly compacted and contained organics in boring T-8. We anticipate subgrade repair measures (undercut and replacement) will be required in some areas.
- **Wet Soil Conditions –** A drainage swale with check dams was constructed in the southeastern portion of the building footprint and contain wet and saturated soils. Undercut of wet soils within this drainage swale should be anticipated prior to fill placement operations.
- **Difficult Excavations –** Partially weathered rock (PWR) material was found at erratic depths across the site. These materials may require use of mechanical equipment (hoe ram, jackhammers) to loosed materials prior to excavation.

6.2 Earthwork

6.2.1 Site Preparation - General

Site grading will be difficult due to fine-grained, near-surface soils encountered. This will be especially true if site grading occurs during periods of extended rainfall that generally occur during the winter and early spring months. Near-surface soils are moisture sensitive, and when wet, will tend to rut and pump under rubber-tired traffic and provide poor subgrade support for structures. To reduce potential earthwork problems, site preparation and grading should be scheduled during the typically drier summer months, if possible. If grading during wet weather is attempted, repair of near-surface soils and possible use of select off-site borrow will be necessary to adequately prepare subgrades for new construction.

Heavy rubber-tired construction equipment should not be allowed to operate on exposed subgrades during wet conditions. Even during drier periods of the year, we recommend that exposed subgrades be sloped and sealed at the end of each day to promote runoff and reduce infiltration from rainfall. Water should not be allowed to pond on exposed subgrades. To further reduce potential deterioration of exposed subgrades, construction traffic patterns should be managed to limit equipment passes across the site.

6.2.2 Subgrade Evaluation and Repair

After initial site preparation is complete, subgrades should be evaluated by the geotechnical engineer or their representative prior to fill placement. This evaluation should include proofrolling with a fully loaded tandem-axle dump truck or similar rubber-tired construction equipment. Areas that deflect excessively should be repaired. Repair measures may include discing, drying, in-place densification, or undercut and replacement with select backfill material consisting of relatively clean, granular materials (i.e. clean sand or stone). This will be a field decision at time of grading.

Poorly compacted fill was found in boring T-8 and relatively loose residual soils were found in boring T-3. These areas must be carefully evaluated and repaired as needed. We anticipate undercut of saturated near-surface soils within the drainage swale will also be required.

6.2.3 *Excavations*

A finish floor elevation of 312 feet is planned for the majority of the building, except for the northeastern corner which will have an approximate FFE of 307. We have assumed excavations for footings and utilities will extend about 3 feet below FFE. Based on subsurface conditions encountered and our assumed grading depths, low to high consistency fill and residual soils and partially weathered rock will be encountered during mass grading and in excavations for foundations and utility trenches. Auger refusal materials could be encountered, depending on excavation depths for utility lines or underground structures.

Low to moderate consistency soils can be excavated using backhoes, bulldozers, and other types of typical earthmoving equipment. Partially weathered rock material will likely require using mechanical equipment such as a hoe ram or jackhammer. Partially weathered rock can be especially difficult and slow to excavate using typical earth moving equipment. Removal of auger refusal materials will require mechanical equipment or possibly blasting.

Excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is responsible for site safety. This information is provided only as a service and under no circumstances should we be assumed responsible for construction site safety.

6.2.4 *Groundwater*

Groundwater was encountered at depths ranging from about 15 to 19 feet below ground surface. Perched water frequently exists in this geology and should be expected during wet periods of the year. Groundwater and perched water elevations can be expected to fluctuate due to seasonal variations in rainfall, evaporation, and other factors. The contractor should be prepared to control groundwater during construction.

To reduce water infiltration into foundation bearing soils, we recommend soil surfaces that abut the building be properly compacted and sloped away from the building.

6.2.5 *Structural Fill*

Soils encountered in the borings were visually classified as low plasticity silts and clays (ML and CL), and silty and clayey sands (SM and SC). The low plasticity soil types (ML, CL, SM and SC) should be suitable for reuse as structural fill provided that moisture content is properly controlled during placement and compaction and other requirements of fill stated in this section are met. Laboratory testing indicates natural moisture contents range from about 6 to 16 percent and will likely require moisture conditioning (wetting/drying) prior to compaction. Based on previous explorations at this site, onsite soils may require significant drying prior to their use. Though not encountered in borings during this exploration, highly plastic soils (MH and CH) may be used as structural fill but should be placed in designated deeper fill sections. Highly plastic soils should not be used as fill in the upper 3 feet beneath structures or behind retaining structures.

Structural fill should be free of trash, debris, or other deleterious material and contain less than 3 percent organics. Structural fill should have a maximum particle size of 3 inches in any dimension and have a maximum dry density

of at least 95 pounds per cubic foot (pcf). Moisture conditioning (drying and wetting) should be anticipated to obtain recommended compaction.

6.2.6 Fill Placement and Compaction

Structural fill should be placed in 8- to 10-inch thick lifts (loose measure) and compacted to at least 95 percent of its standard Proctor maximum dry density at moisture contents within 3 percent of optimum moisture. The upper 12 inches below buildings should achieve at least 98 percent compaction. Based on laboratory natural moistures from previous explorations at this site, some moisture conditioning (drying) will be required to obtain the recommended compaction.

Fill placement and compaction operations should be observed by a qualified soil technician working under the supervision of a geotechnical engineer. An appropriate number of soil density tests should be conducted to confirm that adequate fill compaction is achieved. Fill should not be placed in areas where free water is standing, on frozen subsoil, or on surfaces which have not been approved by the qualified soil technician.

6.3 Foundation Recommendations

We have been provided a maximum column load of 475 kips and have assumed wall, and slab loads of 10 kips per linear foot, and 150 pounds per square foot, respectively. Based on our understanding of structural loads and site grading, building foundations can be supported on shallow spread footings designed for an allowable net bearing pressure of 3,000 pounds per square foot (psf). This bearing pressure assumes that footings will bear in approved natural soils or compacted structural fill, and that the site is prepared as recommended herein. Continuous wall footings should be at least 18 inches wide, and isolated column footings should be at least 24 inches wide. Footings should bear at least 18 inches below exterior grade to avoid frost penetration and develop the design bearing capacity.

Based on encountered subsurface conditions and assumed structural loads, we estimate that total post-construction settlement of building foundations will be on the order of 1 inch or less. This assumes that all structural fill is properly placed and compacted. A detailed foundation layout with structural loads is required to estimate differential settlement; however, we would estimate differential settlements of one half of the total settlement between adjacent columns provided the buildings are supported on similar soil types with similar consistencies.

The bottom of footing excavations should be evaluated by the project geotechnical engineer or a soils technician working under the direction of the geotechnical engineer. The evaluation should include using a hand auger and dynamic cone penetrometer (DCP) testing to determine the consistency of subgrade soils and that subsurface conditions beneath foundation elements are consistent with those encountered in the soil borings. Soils that appear unstable should be over-excavated and replaced with washed stone (NCDOT No. 57) or lean concrete. If washed NCDOT #57 stone is used as undercut backfill, foundations should be poured the same day to avoid rainfall and runoff pooling in the washed stone. If not, then we recommend placing a 3-inch mud mat to protect foundation bearing surface.

6.4 Floor Slabs

Provided site preparation recommendations herein are implemented, subsurface conditions should be suitable for slab-on-grade support of light to moderate live loads. We have assumed floor slab loads of 150 psf. We recommend a 6-inch thickness of compacted dense graded aggregate (NCDOT ABC gradation) beneath the slab to enhance uniform slab support. A vapor retarder should be included in the slab design if vapor penetration is an unacceptable condition. Slab subgrades should be evaluated by proofrolling with overlapping passes of a fully-loaded tandem-axle dump truck. Provided subgrade materials are stable under proofrolling, a modulus of subgrade reaction value (k-value) of 120 psi/inch may be used for slab-on-grade design.

6.5 Seismic Site Classification

Based on our test borings and Section 1613 of the North Carolina Building Code 2018 Edition, the site is a **Seismic Site Class D**.

6.6 Pavement Design Recommendations

We understand heavy-duty pavements along the south and east of the Technology 4.0 Building are planned. S&ME has previously provided pavement design recommendations as discussed below. Provided the site is prepared as recommended herein, the following pavement sections can be utilized for pavements associated with the Technology 4.0 building.

- Heavy Duty Concrete Pavements (Geotechnical Exploration Report – WTCC CEP East Campus, S&ME project number 206905, Table 7-2, dated January 28, 2021)

Table 6-1 – Concrete Pavement Recommendations

Material Type	Concrete Pavement Design
Air Entrained Concrete (4000 psi)	6 inches
Aggregate Base Course (ABC) stone	6 inches
Maximum Joint Spacing	12 feet in all directions

- Heavy Duty Asphalt Pavements (Geotechnical Exploration Report – WTCC CEP East Campus – Southern Loop Road, S&ME project number 206905 CO-1, Table 7-1, report dated April 8, 2022)

Table 6-2 – Asphalt Pavement Recommendations

Material Type	Heavy Duty
Asphalt Surface Course (S-9.5C)	2 inches
Asphalt Intermediate Course (I-19.0C)	4 inches
Aggregate Base Course	8 inches

*Should be placed in two lifts.

- Light Duty and Heavy Duty Asphalt Pavements (Geotechnical Letter Report – Alternative Pavement Sections – WTCC CEP East Campus, Table 1, dated July 14, 2021)

Table 6-3 – Asphalt Pavement Thickness Recommendations

Material Type	Light Duty	Light Duty Alternative	Heavy Duty	Heavy Duty Alternative
Asphalt Surface Course (S-9.5B)	3 inches*	2 inches	2 inches	1.5 inches
Asphalt Intermediate Course (I-19.0C)	---	---	4 inches	2.5 inches
Aggregate Base Course	8 inches	8 inches	8 inches	8 inches
Geogrid (BX1200 or equivalent)	---	1 Layer	---	1 Layer

**Should be placed in two lifts.*

- Heavy Duty Concrete Pavement with Brick Pavers (Heavy Duty Pavement Report – WTCC General Education Building, project number 216569, Table 5-1, dated May 31, 2022)

Table 6-4 – Heavy Duty Concrete with Brick Pavers

Material Type	Thickness
Brick Pavers	2 inches[1]
Air Entrained Concrete (4,000 psi)	5 inches
Aggregate Base Course	6 inches
Maximum Joint Spacing	12 feet in all directions

[1] We assumed the brick pavers will be at least 2 inches thick.

Saw joints should be cut to a depth of at least ¼ of the thickness of the concrete pavement to promote shrinkage cracking along the joint.

All materials and construction methods should conform to the 2018 edition of the NCDOT "Standard Specifications for Roads and Structures." The aggregate base course (ABC) stone should consist of stone meeting the requirements under Section 520. ABC stone should be compacted to at least 98 percent of the maximum dry density as determined by the modified Proctor compaction test, AASHTO T-180M as modified by NCDOT. To confirm that the base course stone has been uniformly compacted, in place density tests should be performed by a qualified soils technician and the area should be thoroughly proofrolled under his observation.

Asphaltic concrete should conform to Section 610 in the 2018 edition of the NCDOT "Standard Specifications for Roads and Structures." Sufficient testing and observations should be performed during pavement construction to confirm that the required thickness, density, and quality requirements of the specifications are achieved.

Although our analysis was based on traffic loading for a 20-year design life, our experience indicates that pavement maintenance is necessary. Routine maintenance in the form of sealing, patching, and maintaining

proper drainage is required to increase pavement life. It is not uncommon for overlays to be required after 10 to 12 years. Maintenance measures for the brick paver should be provided by the manufacturer.

7.0 Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

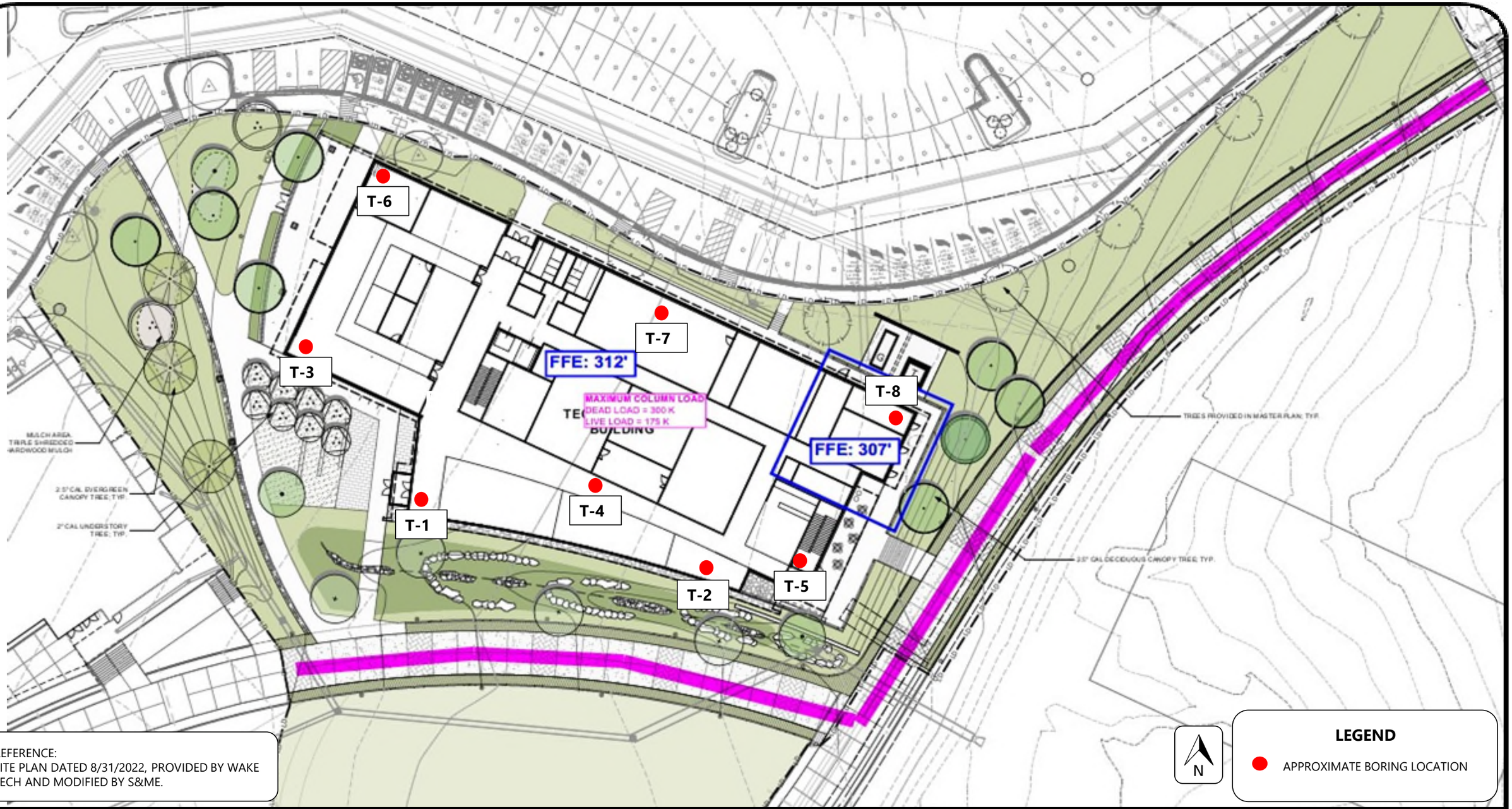
Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). The environmental assessment of this site is being handled by a separate consultant.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

Appendix I – Figures



REFERENCE:
SITE PLAN DATED 8/31/2022, PROVIDED BY WAKE TECH AND MODIFIED BY S&ME.

LEGEND

● APPROXIMATE BORING LOCATION

BORING LOCATION PLAN

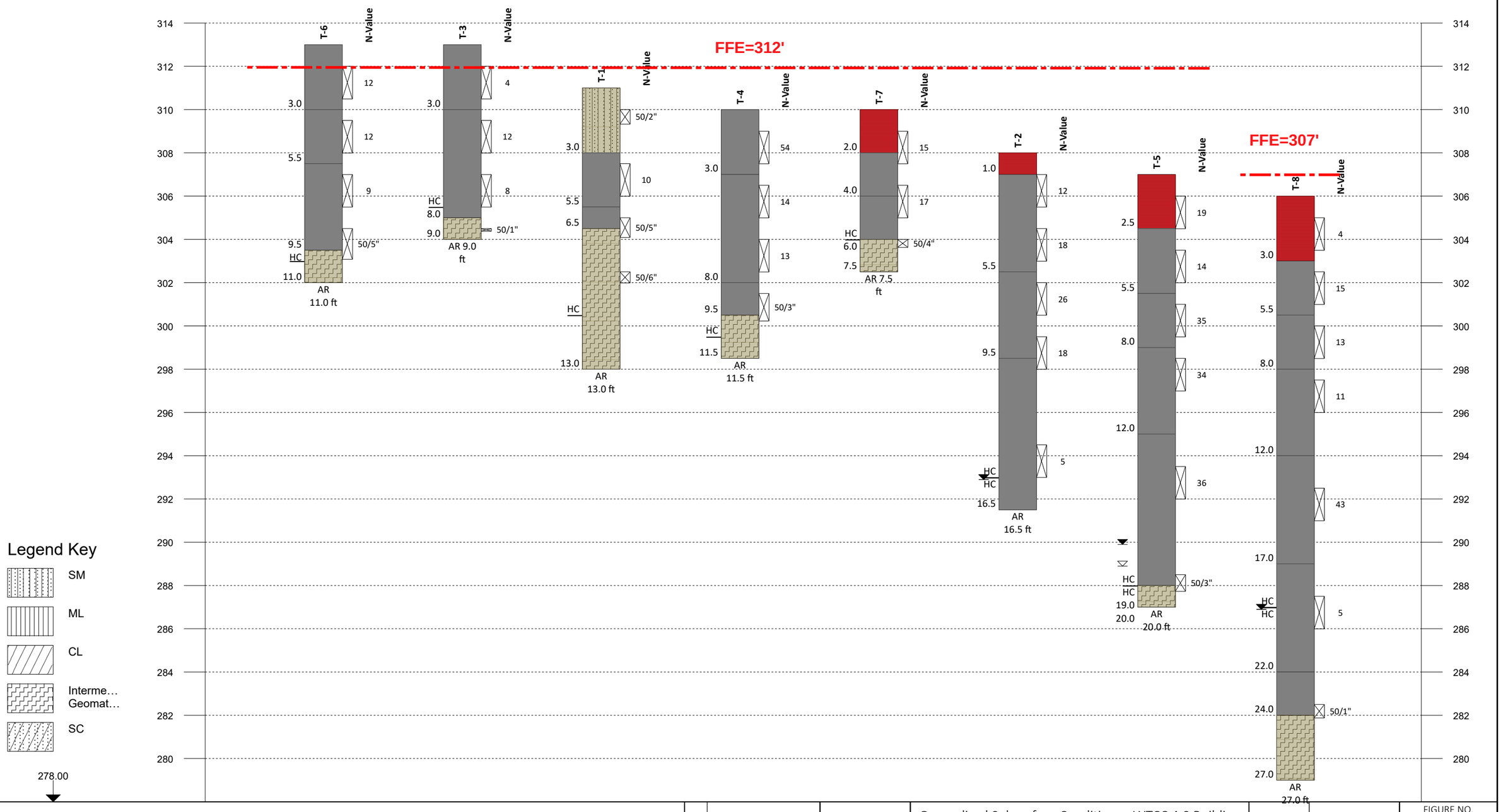
WTCC EAST WAKE TECHNOLOGY 4.0 BUILDING
WENDELL, NORTH CAROLINA

SCALE:
NOT TO SCALE

DATE:
11-18-2022

PROJECT NUMBER:
22050739

FIGURE NO.
1



The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgement. The actual subsurface conditions will vary between boring locations.

▽	AT TIME OF DRILLING
▼	END OF DRILLING
▼	AFTER DRILLING

Generalized Subsurface Conditions - WTCC 4.0 Building Borings

WTCC East Wake Technology 4.0 Building

SCALE:	Not to scale
DATE:	Nov 22, 2022
PROJECT NUMBER:	22050739

FIGURE NO.

2

Appendix II – Boring Logs

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-1 *Sheet 1 of 1*
DATE DRILLED: 11/02/2022	**ELEVATION:** 311 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 13.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807574 **LONGITUDE:** -78.416016
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA (△ % Fines, ○ NMC, ⊢ PL---LL; 20 40 60 80)	ELEVATION
0		IGM		SS-1 (8 in)	SILTY SAND (SM), trace mica, very dense, tan orange, fine to medium grained, moist	10-50/2" N = 50/2"		311
3.0		Residuum		SS-2 (18 in)	SILTY SAND (SM), loose, orange tan and gray, fine to coarse grained, moist	7-6-4 N = 10		
5								306
5.5				SS-3 (11 in)	SILTY SAND (SM), very dense, tan gray, fine grained, moist	18-50/5" N = 50/5"		
6.5		IGM			PWR, sampled as SILTY SAND (SM), very dense, tan gray, fine to coarse grained, moist			
				SS-4 (6 in)		50/6" N = 50/6"		
10	Hole Cave at 10.5 feet							301
13.0	Auger refusal at 13.0 feet				Borehole terminated at 13.0 feet			
15								296
20								291
25								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/02/2022		Caved dry at 10.5'
END OF DRILLING	▼			
AFTER DRILLING	▼			
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-2 *Sheet 1 of 1*
DATE DRILLED: 11/01/2022	**ELEVATION:** 308 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 16.5 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807646 **LONGITUDE:** -78.415611
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA (△ % Fines, ○ NMC, ⊢ PL---LL; 20 40 60 80)	ELEVATION
0		Fill			SILTY SAND (SM), few mica, medium dense, dark gray to orange, fine grained, wet	2-4-8 N = 12		308
1.0		Residuum		SS-1 (18 in)	SANDY SILT (ML), trace mica, stiff to very stiff, red tan and orange, moist			
				SS-2 (18 in)		5-8-10 N = 18		
5								303
5.5				SS-3 (18 in)	SILTY SAND (SM), trace clay, trace mica, medium dense, orange and tan gray, fine grained, moist	19-19-7 N = 26		
				SS-4 (18 in)		15-12-6 N = 18		
9.5					SILTY SAND (SM), with mica, loose to medium dense, brown tan, fine grained, wet			
10								298
				SS-5 (18 in)		3-2-3 N = 5		
15	Hole Cave at 15.0 feet Hole Cave at 15.0 feet Auger refusal at 16.5 feet							293
16.5					Borehole terminated at 16.5 feet			
20								288
25								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/01/2022	15.0	Caved wet at 15'
END OF DRILLING	▼			
AFTER DRILLING	▼	11/02/2022	15.0	Caved wet at 15'
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

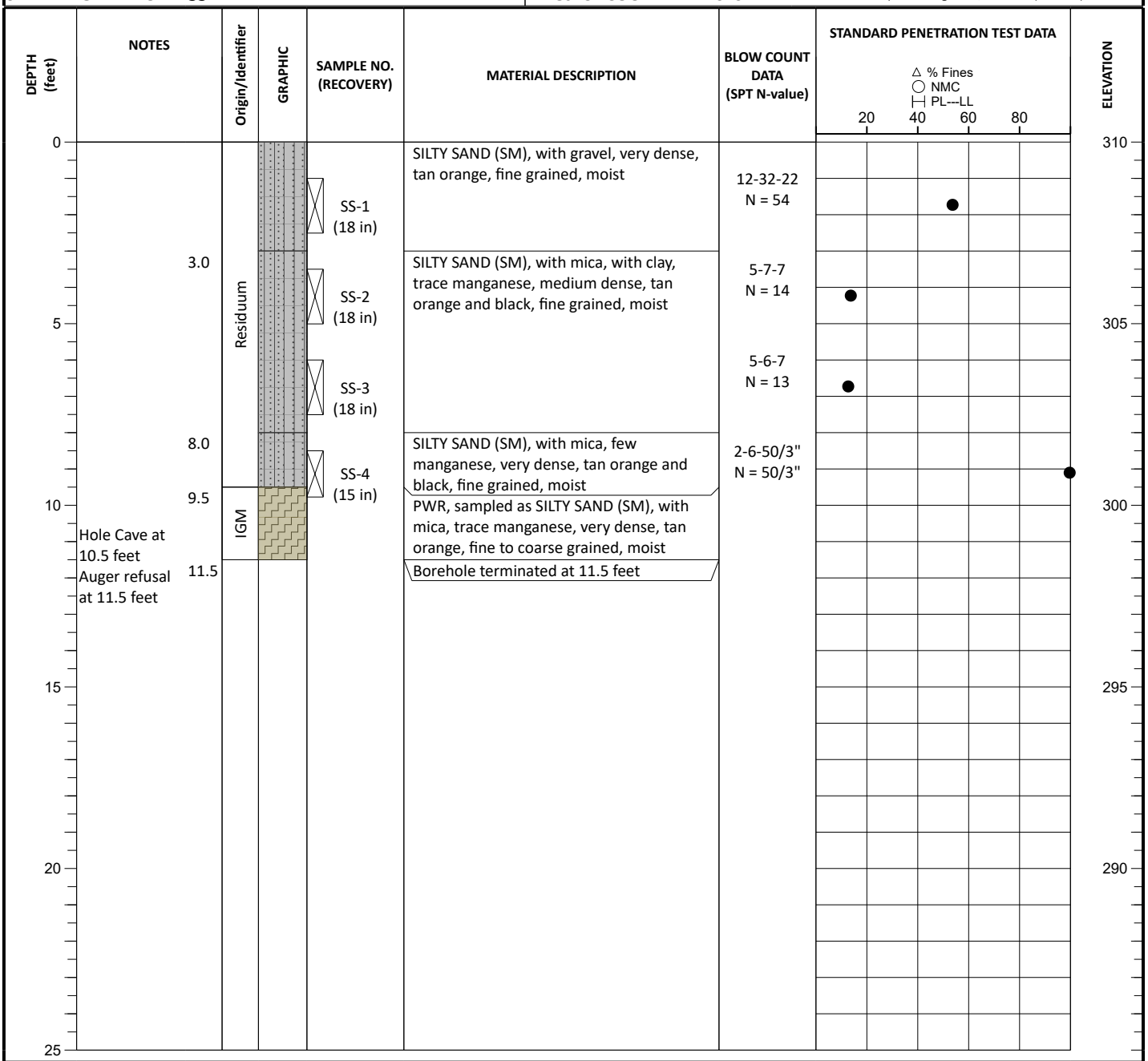
PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-3 *Sheet 1 of 1*
DATE DRILLED: 11/02/2022	**ELEVATION:** 313 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 9.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807672 **LONGITUDE:** -78.416251
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA (△ % Fines, ○ NMC, ⊢ PL---LL; 20 40 60 80)	ELEVATION
0								313
				SS-1 (18 in)	SILTY SAND (SM), few gravel, with mica, very loose, brown to gray, fine grained, moist	2-2-2 N = 4	●	
3.0		Residuum		SS-2 (18 in)	SILTY SAND (SM), trace rock fragments, with mica, loose to medium dense, tan gray and black, fine to coarse grained, moist	8-8-4 N = 12	●	
5				SS-3 (18 in)		2-4-4 N = 8	●	308
	Hole Cave at 7.5 feet							
8.0		IGM		SS-4 (1 in)	PWR, sampled as SILTY SAND (SM), very dense, tan gray, fine grained, moist	50/1" N = 50/1"	●	
9.0	Auger refusal at 9.0 feet				Borehole terminated at 9.0 feet			
10								303
15								298
20								293
25								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/02/2022		Caved dry at 7.5'
END OF DRILLING	▼			
AFTER DRILLING	▼			
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

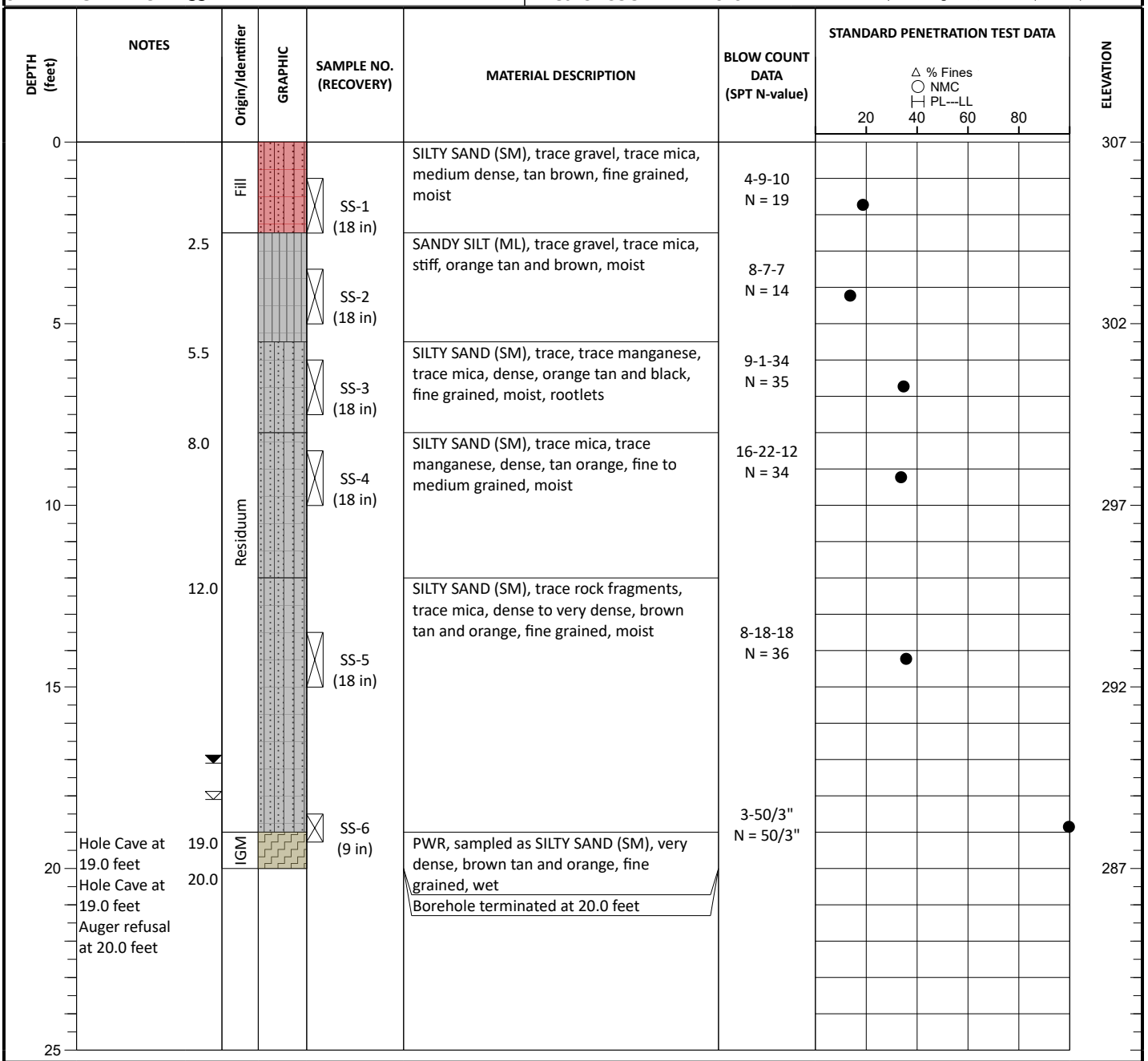
PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-4 *Sheet 1 of 1*
DATE DRILLED: 11/02/2022	**ELEVATION:** 310 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 11.5 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807671 **LONGITUDE:** -78.415808
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	



GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/02/2022		Caved dry at 10.5'
END OF DRILLING	▼			
AFTER DRILLING	▼			
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

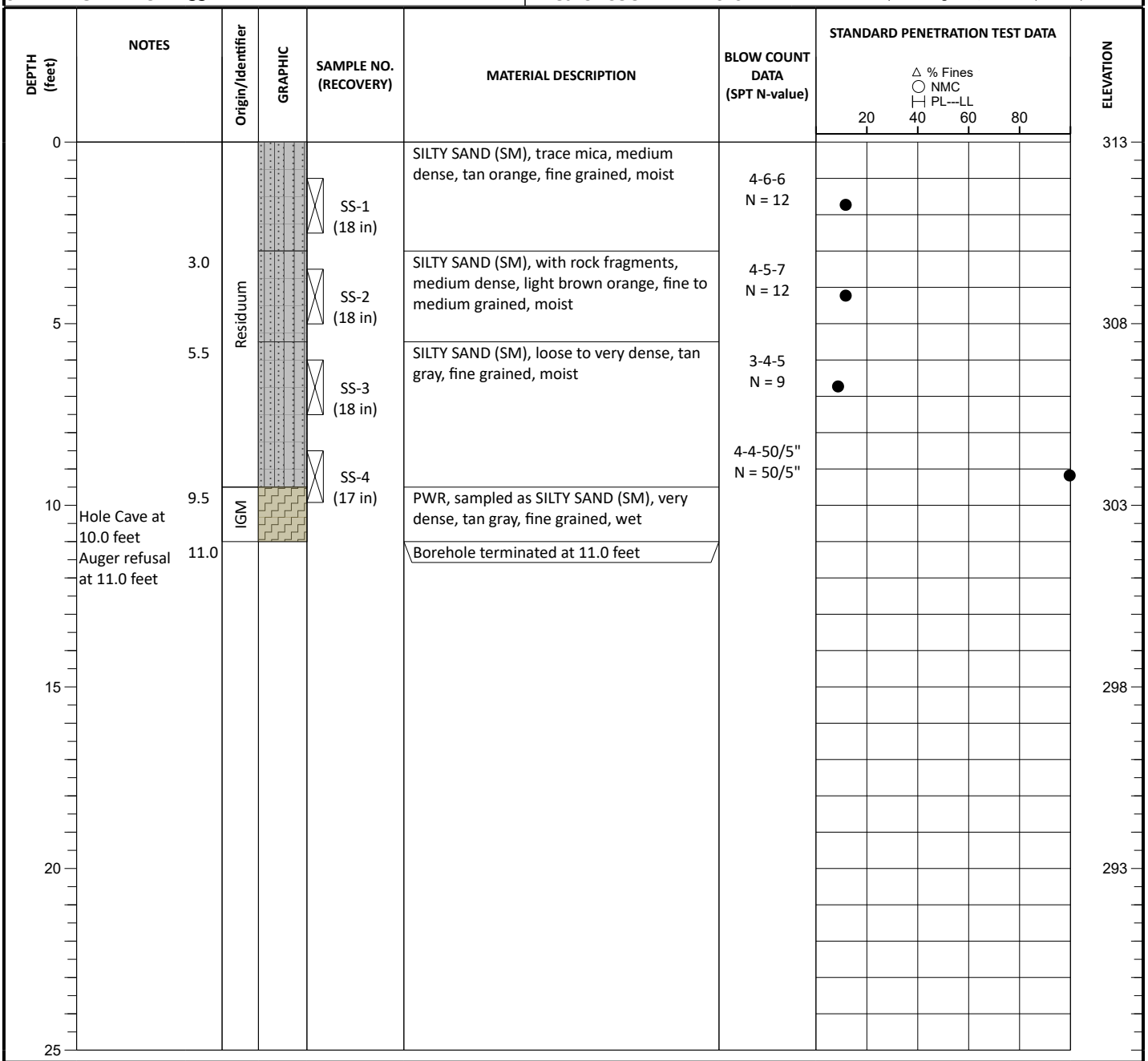
PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-5 *Sheet 1 of 1*
DATE DRILLED: 11/01/2022	**ELEVATION:** 307 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 20.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807694 **LONGITUDE:** -78.415507
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	



GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/01/2022	18.0	Caved wet at 19'
END OF DRILLING	▼			
AFTER DRILLING	▼	11/02/2022	17.0	Caved wet at 19'
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-6 *Sheet 1 of 1*
DATE DRILLED: 11/02/2022	**ELEVATION:** 313 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 11.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807878 **LONGITUDE:** -78.416253
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	



GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/02/2022		Caved dry at 10'
END OF DRILLING	▼			
AFTER DRILLING	▼			
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-7 *Sheet 1 of 1*
DATE DRILLED: 11/01/2022	**ELEVATION:** 310 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 7.5 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807882 **LONGITUDE:** -78.415823
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA (△ % Fines, ○ NMC, ⊢ PL---LL; 20 40 60 80)	ELEVATION
0		Fill		SS-1 (18 in)	SILTY SAND (SM), trace mica, medium dense, dark gray to brown, fine grained, moist	5-6-9 N = 15		310
2.0		Residuum			SILTY SAND (SM), trace mica, medium dense, dark gray, fine grained, moist			
4.0				SS-2 (18 in)	SILTY SAND (SM), trace manganese, trace mica, medium dense, orange tan and black, fine grained, moist	24-7-10 N = 17		305
6.0	Hole Cave at 6.0 feet	IGM		SS-3 (4 in)	PWR, sampled as SANDY SILT (ML), very hard, gray brown, moist	50/4" N = 50/4"		
7.5	Auger refusal at 7.5 feet				Borehole terminated at 7.5 feet			300
10								295
15								290
20								
25								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/01/2022		Caved dry at 6'
END OF DRILLING	▼			
AFTER DRILLING	▼			
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-8 *Sheet 1 of 2*
DATE DRILLED: 11/01/2022	**ELEVATION:** 306 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 27.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807881 **LONGITUDE:** -78.415478
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA (△ % Fines, ○ NMC, ⊢ PL---LL; 20 40 60 80)	ELEVATION
0		Fill		SS-1 (18 in)	SANDY LEAN CLAY (CL), trace, soft, brown and black, moist, organic odor, small wood pieces	2-2-2 N = 4		306
3.0				SS-2 (18 in)	CLAYEY SAND (SC), trace mica, medium dense, brown gray, fine grained, moist	12-10-5 N = 15		
5								301
5.5				SS-3 (18 in)	SILTY SAND (SM), trace rock fragments, trace mica, medium dense, orange tan, fine grained, moist	5-5-8 N = 13		
8.0				SS-4 (18 in)	SILTY SAND (SM), medium dense, white tan and brown, fine grained, moist	5-5-6 N = 11		
10								296
12.0		Residuum		SS-5 (18 in)	SILTY SAND (SM), dense, tan gray, fine grained, moist	11-24-19 N = 43		
15								291
17.0				SS-6 (18 in)	SILTY SAND (SM), trace mica, trace manganese, loose, white gray with tan brown, fine grained, wet	2-2-3 N = 5		
20	Hole Cave at 19.0 feet Hole Cave at 19.0 feet							286
22.0				SS-7 (7 in)	SILTY SAND (SM), trace rock fragments, very dense, light tan white, fine grained, wet	12-50/1" N = 50/1"		
24.0		IGM			PWR, sampled as SILTY SAND (SM), very dense, light tan white, fine grained, wet			
25								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/01/2022	19.0	Caved wet at 19'
END OF DRILLING	▼			
AFTER DRILLING	▼	11/02/2022	19.0	Caved wet at 19'
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

PROJECT:	WTCC East Wake Technology 4.0 Building S&ME Project No. 22050739	BORING LOG: T-8 *Sheet 2 of 2*
DATE DRILLED: 11/01/2022	**ELEVATION:** 306 ft	**NOTES:** Boring location and elevation are approximate.
DRILL RIG: D-50	**DATUM:** NAVD88	
DRILLER: Brandon Blizzard	**BORING DEPTH:** 27.0 ft	
HAMMER TYPE: Automatic hammer	**CLOSURE:** Cuttings with Hole Closure Device	
DRILLING METHOD: 3-1/4" HSA	**LOGGED BY:** William Harrison	**LATITUDE:** 35.807881 **LONGITUDE:** -78.415478
SAMPLING METHOD: SS	**PROJECT COORDINATE SYSTEM -** World Geodetic System Longitude / Latitude (WGS 84)	

DEPTH (feet)	NOTES	Origin/Identifier	GRAPHIC	SAMPLE NO. (RECOVERY)	MATERIAL DESCRIPTION	BLOW COUNT DATA (SPT N-value)	STANDARD PENETRATION TEST DATA △ % Fines ○ NMC ⊢ PL---LL 20 40 60 80	ELEVATION
		IGM			PWR, sampled as SILTY SAND (SM), very dense, light tan white, fine grained, wet			
	Auger refusal at 27.0 feet 27.0				Borehole terminated at 27.0 feet			
30								276
35								271
40								266
45								261
50								

GROUNDWATER		DATE	DEPTH (FT)	REMARKS
ATD	▽	11/01/2022	19.0	Caved wet at 19'
END OF DRILLING	▼			
AFTER DRILLING	▼	11/02/2022	19.0	Caved wet at 19'
AFTER DRILLING	▼			

GROUNDWATER DEPTHS ARE NOT EXACT AND MAY VARY SUBSTANTIALLY FROM THOSE INDICATED. ATD = AT TIME OF DRILLING
LL=Liquid Limit, PL = Plastic Limit, NMC = Natural Moisture Content, PPV = Pocket Penetrometer (tsf), PTV = Pocket Torvane (tsf), AR = Auger Refusal

Appendix III – Laboratory Test Results

Form No: TR-D2216-T265-2
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	22050739	Report Date:	11/14/11
Project Name:	WTCC East Wake Technology 4.0 Building	Test Date(s):	11/9-11/11/22
Client Name:	Wake Technical Community College		
Client Address:	9101 Fayetteville Rd., Raleigh, NC 27603		
Sample by:	S&ME	Sample Dates:	11/2/22
Sampling Method:	Split Spoon	Drill Rig :	N/A

Method: **A (1%)** **B (0.1%)** ☑ Balance ID. 14862 Calibration Date: 7/1/22 Oven ID. 14603 Calibration Date: 7/20/22

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft. or m.		grams	grams	grams	grams	%
T-3	SS-1	1.0'-2.5'	HN	0.00	308.47	268.62	39.85	14.8%
T-3	SS-2	3.5'-5.0'	1520	0.00	300.35	283.95	16.40	5.8%
T-8	SS-1	1.0'-2.5'	51	0.00	247.79	222.28	35.51	16.0%
T-8	SS-2	3.5'-5.0'	520	0.00	313.75	282.41	31.34	11.1%

Notes / Deviations / References

Tests Performed By: J.FAUCETTE

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Technical Responsibility | *Signature* | *Position* | *Date*

Results shown in this report, relate only to the samples noted above.

SIEVE ANALYSIS OF SOILS

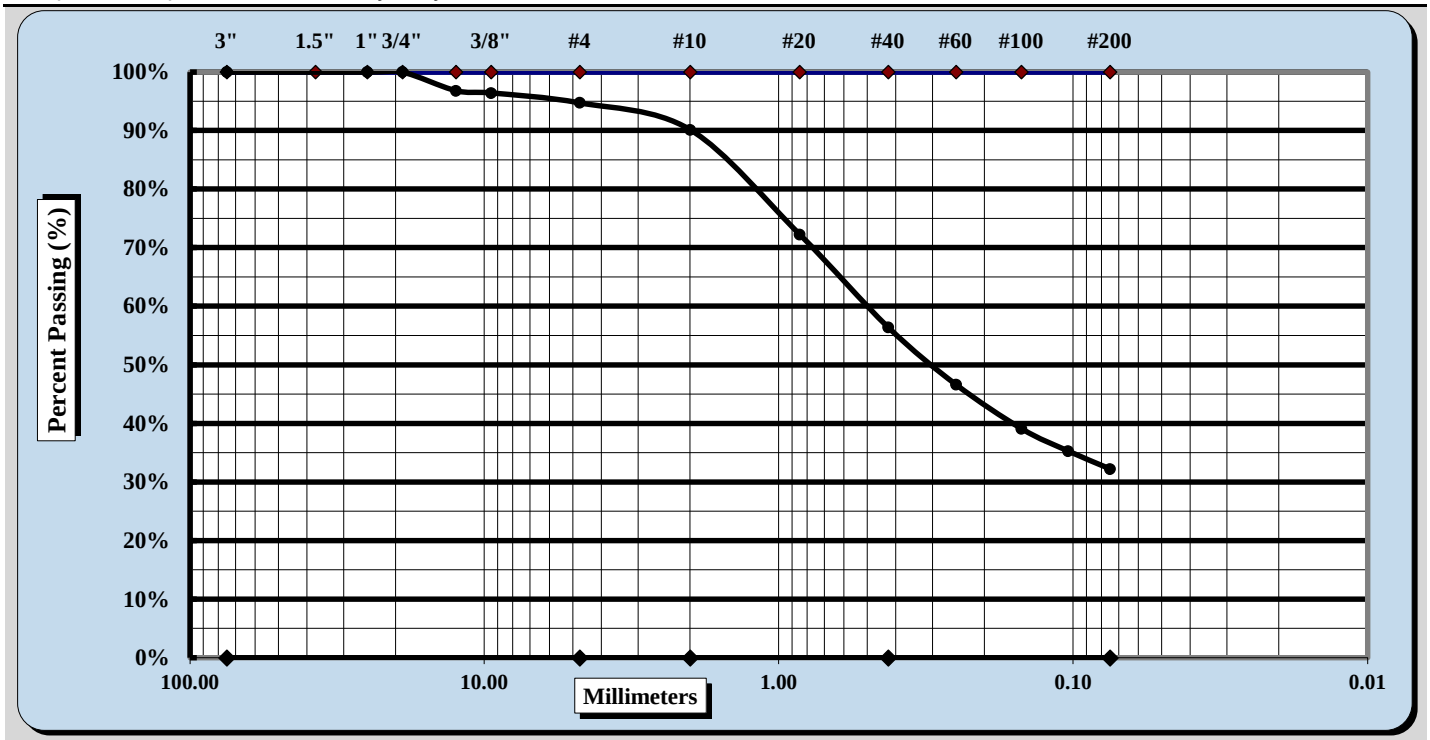
ASTM D422/AASHTO T88

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	22050739	Report Date:	11/14/22
Project Name:	WTCC East Wak Technology 4.0 Building	Test Date(s):	11/9-11/11/22
Client Name:	Wake Technical Community College		
Client Address:	9101 Fayetteville Rd., Raleigh, NC 27603		

Sample Id.	122	Type:	Site Material	Sample Date:	11/2/22
Location:	Soil Boring	Source Loc.:	T-3/SS-1	Depth:	1.0'-2.5'

Sample Description: Gray Silty SAND (SM) with Gravel



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"			Coarse Sand	4.6%	Fine Sand	24.2%
Gravel	5.2%			Medium Sand	33.7%	Silt & Clay	32.2%
Liquid Limit	N/A			Plastic Limit	N/A	Plastic Index	N/A
Assumed SG	2.650	Cc =	N/A	Cu =	N/A	Moisture Content	14.1%
Coarse Sand	4.6%			Medium Sand	33.7%	Fine Sand	24.2%

Notes / Deviations / References: **TEST PERFORMED BY: J. FAUCETTE**

Material tested was from on site (SPT boring T-3/SS-1).

Technical Responsibility	*Signature*	*Position*	*Date*

Results shown in this report, relate only to the sample noted above

SIEVE ANALYSIS OF SOILS

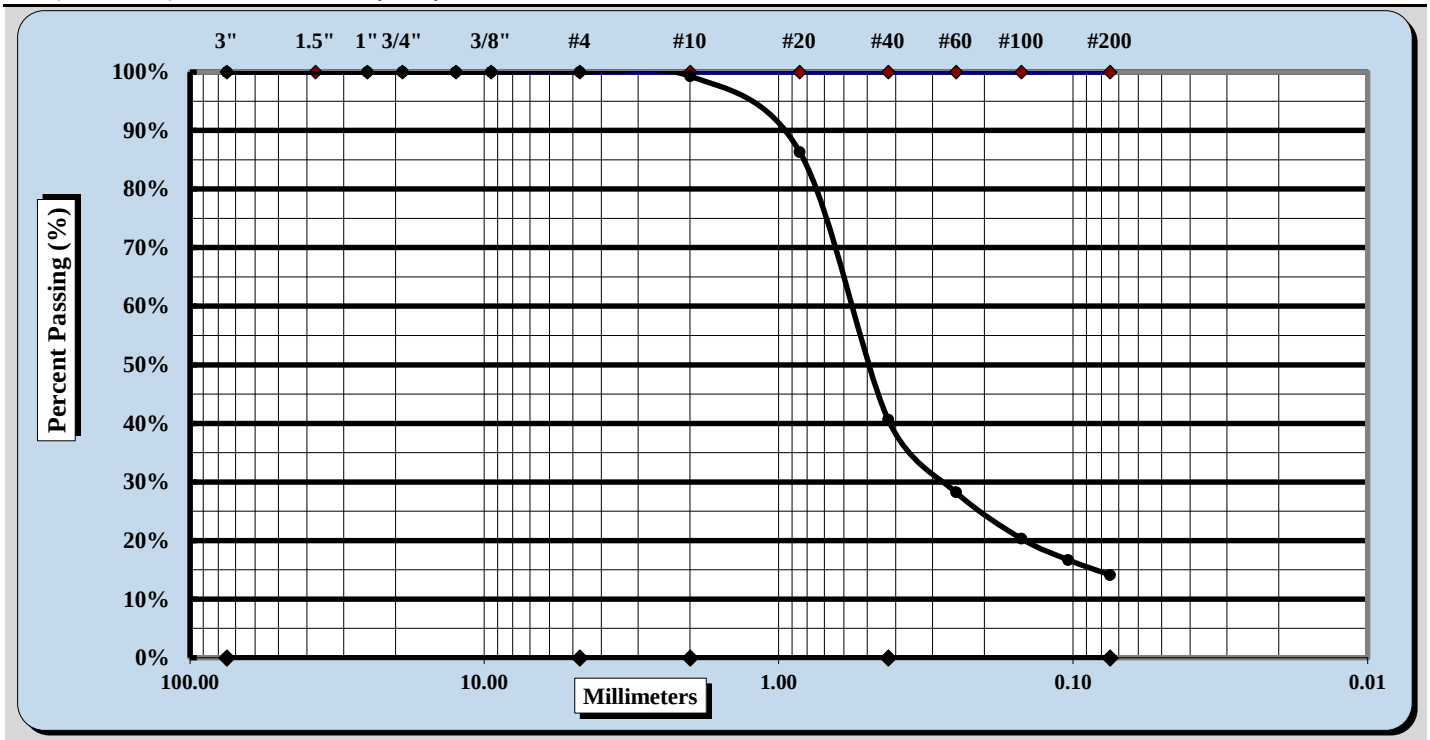
ASTM D422/AASHTO T88

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	22050739	Report Date:	11/14/22
Project Name:	WTCC East Wak Technology 4.0 Building	Test Date(s):	11/9-11/11/22
Client Name:	Wake Technical Community College		
Client Address:	9101 Fayetteville Rd., Raleigh, NC 27603		

Sample Id.	122	Type:	Site Material	Sample Date:	11/2/22
Location:	Soil Boring	Source Loc.:	T-3/SS-2	Depth:	3.5'-5.0'

Sample Description: Gray Silty SAND (SM)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"			Coarse Sand	0.7%	Fine Sand	26.5%
Gravel	0.0%			Medium Sand	58.6%	Silt & Clay	14.2%
Liquid Limit	N/A			Plastic Limit	N/A	Plastic Index	N/A
Assumed SG	2.650	Cc =	N/A	Cu =	N/A	Moisture Content	5.8%
Coarse Sand	0.7%			Medium Sand	58.6%	Fine Sand	26.5%

Notes / Deviations / References: **TEST PERFORMED BY: J. FAUCETTE**

Material tested was from on site (SPT boring T-3/SS-2).

Technical Responsibility	*Signature*	*Position*	*Date*

Results shown in this report, relate only to the sample noted above

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

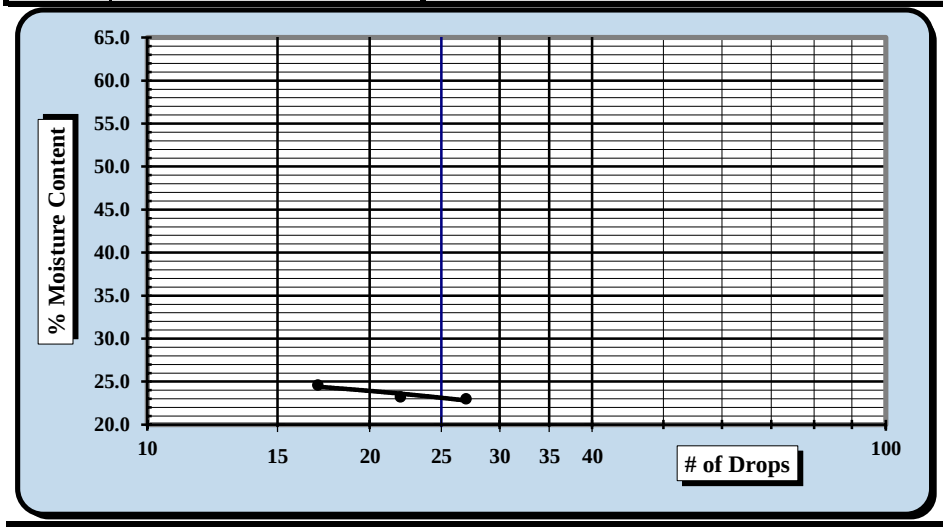
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	22050739	Report Date:	11/14/22
Project Name:	WTCC East Wake Technology 4.0 Building	Test Date(s)	11/9-11/11/22
Client Name:	Wake Technical Community College		
Client Address:	9101 Fayetteville Rd., Raleigh, NC 27603		
Sample Id: 122	Type: Site Material	Sample Date: 11/2/22	
Location: Soil Boring	Source Loc.: T-8/SS-1	Depth(ft): 1.0'-2.5'	
Sample Description:	Gray Lean CLAY		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2022	Grooving tool	14947(B)	7/11/2022
LL Apparatus	14958	7/11/2022	Grooving tool		
Oven	14993	7/20/2022	Grooving tool		

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14	15	
A	Tare Weight	11.05	10.76	12.04				11.79	11.83	
B	Wet Soil Weight + A	23.41	22.11	23.63				21.59	21.24	
C	Dry Soil Weight + A	21.10	19.97	21.34				20.44	20.12	
D	Water Weight (B-C)	2.31	2.14	2.29				1.15	1.12	
E	Dry Soil Weight (C-A)	10.05	9.21	9.30				8.65	8.29	
F	% Moisture (D/E)*100	23.0%	23.2%	24.6%				13.3%	13.5%	
N	# OF DROPS	27	22	17				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**13.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**23**
Plastic Limit	**13**
Plastic Index	**10**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation | Dry Preparation | Air Dried | *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: *ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils*

Tests Performed By: J.FAUCETTE

Technical Responsibility | *Signature* | *Position* | *Date*

Results shown in this report, relate only to the sample noted above

SIEVE ANALYSIS OF SOILS

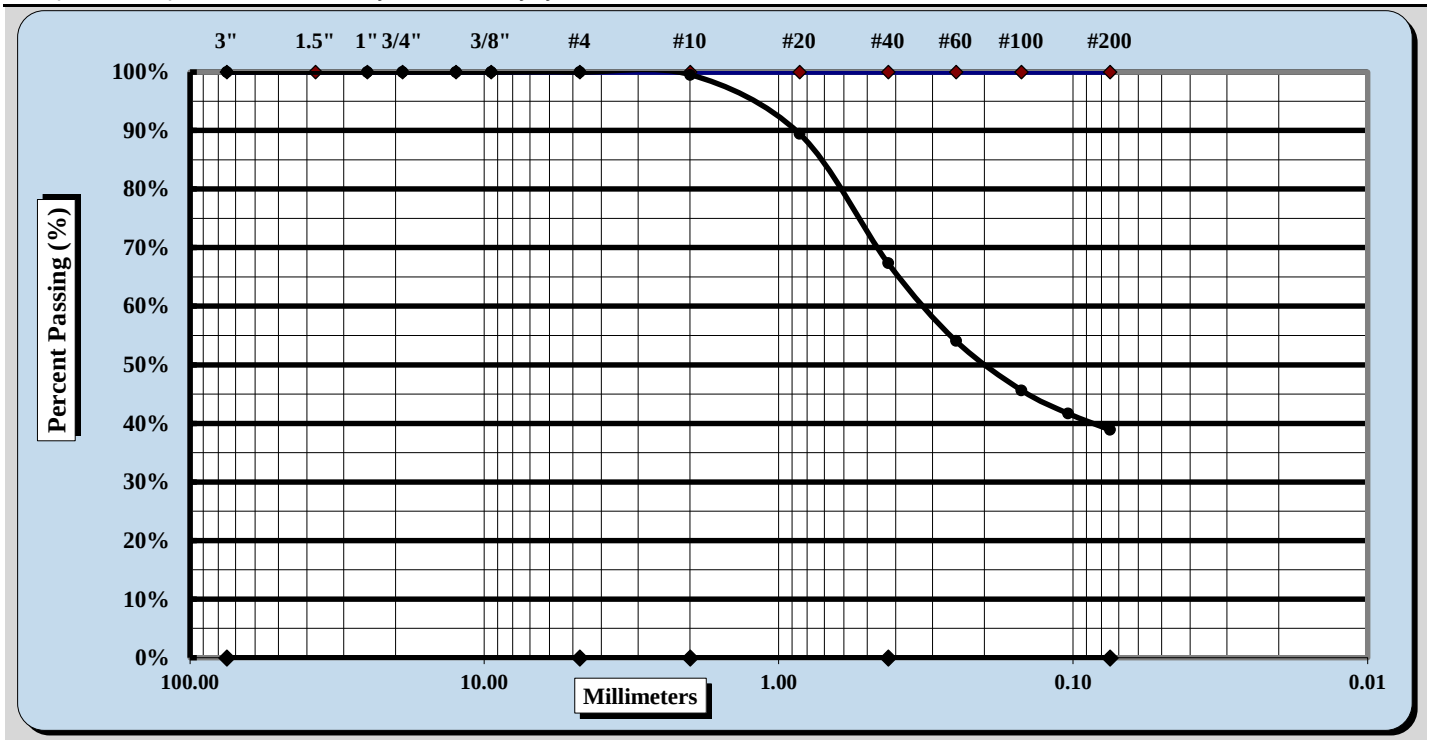
ASTM D422/AASHTO T88

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	22050739	Report Date:	11/14/22
Project Name:	WTCC East Wak Technology 4.0 Building	Test Date(s):	11/9-11/11/22
Client Name:	Wake Technical Community College		
Client Address:	9101 Fayetteville Rd., Raleigh, NC 27603		

Sample Id.	122	Type:	Site Material	Sample Date:	11/2/22
Location:	Soil Boring	Source Loc.:	T-8/SS-2	Depth:	3.5'-5.0'

Sample Description: Gray-Brown Clayey SAND (SC)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

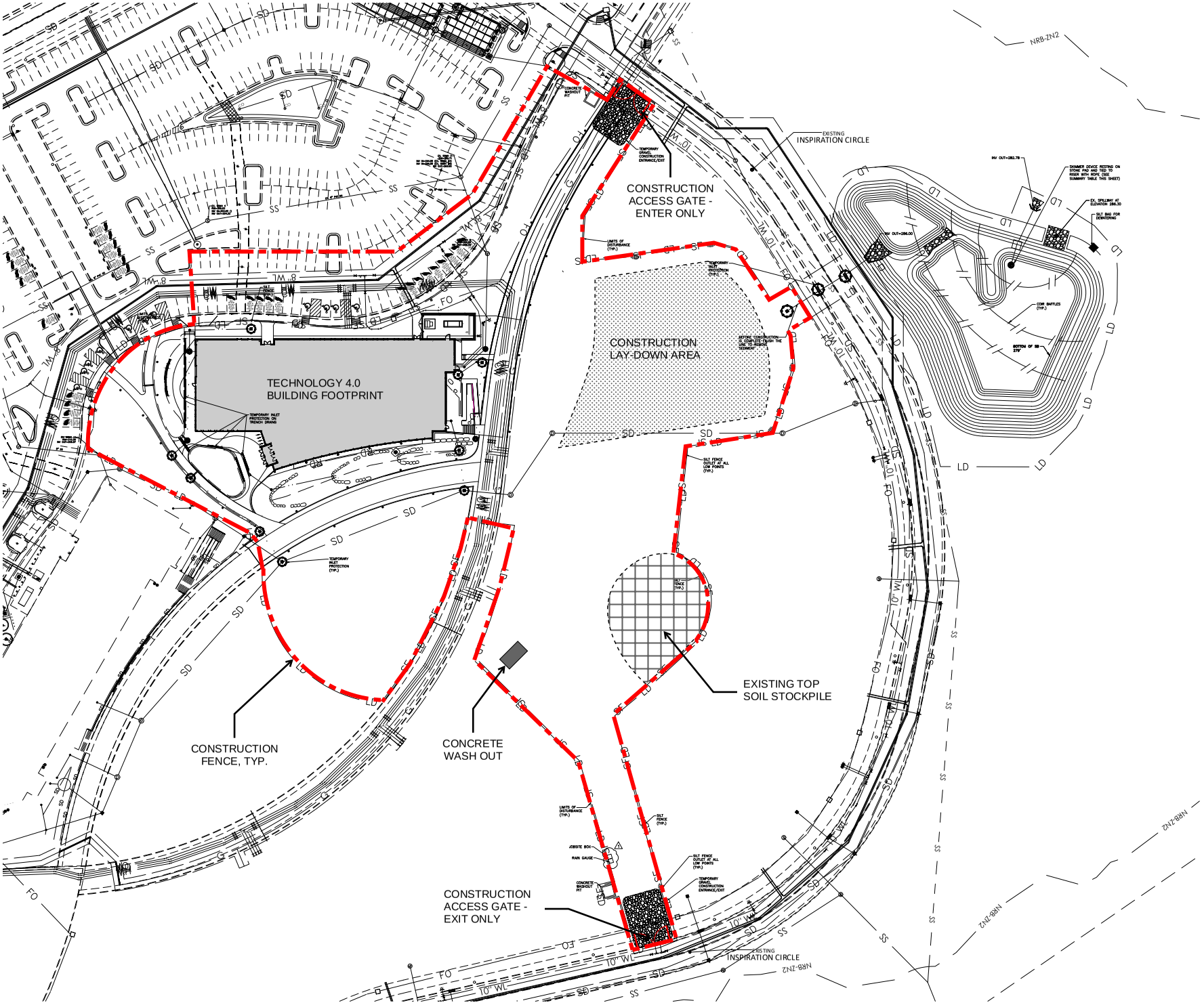
Maximum Particle Size	1/2"			Coarse Sand	0.5%	Fine Sand	28.5%
Gravel	0.0%			Medium Sand	32.2%	Silt & Clay	38.9%
Liquid Limit	N/A			Plastic Limit	N/A	Plastic Index	N/A
Assumed SG	2.650	Cc =	N/A	Cu =	N/A	Moisture Content	11.1%
Coarse Sand	0.5%			Medium Sand	32.2%	Fine Sand	28.5%

Notes / Deviations / References: **TEST PERFORMED BY: J. FAUCETTE**

Material tested was from on site (SPT boring T-8/SS-2).

Technical Responsibility	*Signature*	*Position*	*Date*

Results shown in this report, relate only to the sample noted above



SITE CONSTRUCTION ACCESS PLAN

NTS

12/08/2023

F O R M O F P R O P O S A L

Technology 4.0 Building — Contract: _____

Wake Technical Community College — Bidder: _____

SCO #21-23932-02A — Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

.

The Bidder proposes and agrees if this proposal is accepted to contract with

The Trustees of Wake Technical Community College

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Technology 4.0 Building

in full and complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of

Wake Technical Community College

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT: _____

Base Bid:

_____ Dollars($) _____

General Subcontractor: _____ Lic _____

Plumbing Subcontractor: _____ Lic _____

Mechanical Subcontractor: _____ Lic _____

Electrical Subcontractor: _____ Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALTERNATES:

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" the base bid.

GENERAL CONTRACT:

Alternate No. S1 Carbon Dioxide (CO_2) Mineralized Concrete

(Add) _____ Dollars($)

Alternate No. A1 Roofing Membrane

(Add) _____ Dollars($)

Alternate No. A2 Marker/Glass Boards

(Add) _____ Dollars($)

Alternate No. A3 Architectural Graphic Film

(Add) _____ Dollars($)

Alternate No. A4 Painted Piping in Mechanical Room 140A

(Add) _____ Dollars($)

Alternate No. A5 Ceramic Frit Glass

(Add) _____ Dollars($)

Alternate No. A6 Custom Metal Wall Panels

(Add) _____ Dollars($)

Alternate No. M1 HW/CW Redundant Pumps

(Add) _____ Dollars($)

Alternate No. M2 Bipolar Ionization System

(Add) _____ Dollars($)

Alternate No. E1 Photovolataic Power Generating System

(Add) _____ Dollars($)

Alternate No. AV1 Secondary Displays in Control Room 341

(Add) _____ Dollars($)

Alternate No. PB1 Owner-Preferred Door Hardware

(Add) _____ Dollars($)

Alternate No. PB2 Owner-Preferred Exterior Trash Receptacle

(Add) _____ Dollars($)

Alternate No. PB3 Owner-Preferred Wayfinding Signage

(Add) _____ Dollars($)

Alternate No. PB4 Owner-Preferred Clocks

(Add) _____ Dollars($)

Alternate No. PB5 Owner-Preferred BAS Controls Systems

(Add) _____ Dollars($)

Alternate No. PB6 Owner-Preferred UPS

(Add) _____ Dollars($)

Alternate No. PB7 Owner-Preferred ATS

(Add) _____ Dollars($)

Alternate No. PB8 Owner-Preferred Access Door Controllers & Modules

(Add) _____ Dollars($)

Alternate No. PB9 Owner-Preferred Wall-mounted and Mullion-mounted Card Readers

(Add) _____ Dollars($)

Alternate No. PB10 Owner-Preferred Brick

(Add) _____ Dollars($)

Alternate No. PB11 Owner-Preferred Acoustical Ceiling System

(Add) _____ Dollars($)

Alternate No. PB12 Owner-Preferred Hot Fluid-Applied Asphalt Roofing Assembly

(Add) Dollars($)

Alternate No. PB13 Owner-Preferred Wall Tile

(Add) Dollars($)

Alternate No. PB14 Owner-Preferred Resilient Tile Flooring

(Add) Dollars($)

Alternate No. PB15 Owner-Preferred Tile Carpet

(Add) Dollars($)

UNIT PRICES

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

GENERAL CONTRACT:

No. A1	Moisture-Resistant Sealer-Surfacer	SF	Unit Price ($)
No. A2	Standard Adhesive for Resilient Flooring	SF	Unit Price ($)
No. A3	Moisture-Resistant Adhesive for Resilient Flooring	SF	Unit Price ($)
No. A4	Standard Flooring Adhesive for Carpet	SF	Unit Price ($)
No. A5	Moisture Resistant Adhesive for Carpet	SF	Unit Price ($)
No. C1	Removal of Rock from Trench Excavations	CY	Unit Price ($)
No. C2	Replacement of Unsuitable Soils with Off-Site Fill	CY	Unit Price ($)
No. C3	Undercut and Replacement with 57 Stone	CY	Unit Price ($)
No. C4	Undercut and Replacement with ABC Stone	CY	Unit Price ($)
No. C5	Repair of Unstable Subgrade Soils	SY	Unit Price ($)
No. C6	Removal of Mass/Bulk Rock	CY	Unit Price ($)
No. C7	Haul-in of Off-Site Structural Fill	CY	Unit Price ($)

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 23. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 23.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of Affidavit (**A)** required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By:_____
Signature

Name: _____
Print or type

Title_____
(Owner/Partner/Pres./V.Pres)

Address_____

_____

ATTEST:

By:_____

Title:_____
(Corp. Sec. or Asst. Sec. only)

License No._____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5_____ Addendum No. 6_____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT _____ _____ as principal, and _____, as surety, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the State of North Carolina* through _____ as obligee, in the penal sum of _____ DOLLARS, lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this ____ day of _____ 20__

WHEREAS, the said principal is herewith submitting proposal for and the principal desires to file this bid bond in lieu of making the cash deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forthwith pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn as provided by G.S. 143-129.1

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ❑ **3** – **(15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ❑ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ❑ **6** – **(20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10** - **(20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

***Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

FORM OF CONSTRUCTION CONTRACT

(ALL PRIME CONTRACTS)

THIS AGREEMENT, made the _____ day of _____ in the year of 20__ by and between _____ _____ hereinafter called the Party of the First Part and The Trustees of Wake Technical Community College, through the _____ _____ hereinafter called the Party of the Second Part.

WITNESSETH:

That the Party of the First Part and the Party of the Second Part for the consideration herein named agree as follows:

1. Scope of Work: The Party of the First Part shall furnish and deliver all of the materials, and perform all of the work in the manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part thereof as if fully contained herein: advertisement; Instructions to Bidders; General Conditions; Supplementary General Conditions; specifications; accepted proposal; contract; performance bond; payment bond; power of attorney; workmen's compensation; public liability; property damage and builder's risk insurance certificates; approval of attorney general; certificate by the Office of State Budget and Management, and drawings, titled:

_____

_____

_____

Consisting of the following sheets:

_____

_____

_____

_____

Dated: _____ and the following addenda:

Addendum No _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No _____ Dated: _____ Addendum No. _____ Dated: _____

2. That the Party of the First Part shall commence work to be performed under this agreement on a date to be specified in a written order of the Party of the Second Part and

shall fully complete all work hereunder within _____ consecutive calendar days from said date. For each day in excess thereof, liquidated damages shall be as stated in Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

3. The Party of the Second Part hereby agrees to pay to the Party of the First Part for the faithful performance of this agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States as follows:

_____

_____($_____).

Summary of Contract Award:

4. In accordance with Article 31 and Article 32 of the General Conditions of the Contract, the Party of the Second Part shall review, and if approved, process the Party of the First Party's pay request within 30 days upon receipt from the Designer. The Party of the Second Part, after reviewing and approving said pay request, shall make payments to the Party of the First Part on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the First Party, less five percent (5%) of the amount of such estimate which is to be retained by the Second Party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the Second Party. The Second Party may elect to waive retainage requirements after 50 percent of the work has been satisfactorily completed on schedule as referred to in Article 31 of the General Conditions.

5. Upon submission by the First Party of evidence satisfactory to the Second Party that all payrolls, material bills and other costs incurred by the First Party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within thirty (30) days after the completion by the First Party of all work covered by this agreement and the acceptance of such work by the Second Party.

6. It is further mutually agreed between the parties hereto that if at any time after the execution of this agreement and the surety bonds hereto attached for its faithful performance, the Second Party shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the First Party shall, at its expense, within five (5) days after the receipt of notice from the Second Party so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Second Party. In such event no further payment to the First Party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Second Party.

7. The Party of the First Part attest that it and all of its subcontractors have fully complied with all requirements of NCGS 64 Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the day and date first above written in _____ counterparts, each of which shall without proof or accounting for other counterparts, be deemed an original contract.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____ By: _____
(Proprietorship or Partnership)

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

The Trustees of Wake Technical Community College through

(CORPORATE SEAL)

_____
(Agency, Department or Institution)

Witness:

_____ By:_____

Title: _____

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
(Proprietorship or Partnership)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

_____
Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

_____
(Surety Company)

Witness:

_____

By: _____

Title: _____
(Attorney in Fact)

Countersigned:

_____

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C. Regional or Branch Office Address

(Surety Corporate Seal)

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal (Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

_____
(Proprietorship or Partnership)

Attest: (Corporation)

Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

_____
Contractor: (Trade or Corporate Name)

By: _____

Title_____
(Owner, Partner, or Corp. Pres. or Vice

_____
(Surety Company)

Witness:

_____

By: _____

Title: _____
(Attorney in Fact)

Countersigned:

_____

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

(Surety Corporate Seal)

Sheet for Attaching Power of Attorney

Sheet for Attaching Insurance Certificates

APPROVAL OF THE ATTORNEY GENERAL

CERTIFICATION BY THE OFFICE OF STATE BUDGET AND MANAGEMENT

Provision for the payment of money to fall due and payable by the

_____

under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This _____day of _____ 20___.

Signed _____
Budget Officer

Insurance Certificate – Cancellation Notification Provisions

Many insurance certificates have cancellation notification provisions that conflict with our requirements in the contract General Conditions Article 34. To resolve this conflict in a way acceptable to DOI and SCO, the following wording should be added on the certificate in the block labeled "Description of operations, Vehicles, Exclusions added by endorsements/Special Provisions:"

"Not withstanding the preprinted cancellation provisions on this form, coverages afforded under the policies will not be cancelled, reduced in amount nor will any coverages be eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner, of such alteration or cancellation."

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GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of $300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
   a. Black, that is, a person having origins in any of the black racial groups in Africa;
   b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
   c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
   d. American Indian, that is, a person having origins in any of the original peoples of North America; or
   e. Female

2. Minority Business - means a business:
   a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
   b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".

4. Public Entity - means State and all public subdivisions and local governmental units.

5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.

7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.

9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.

10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

   The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:
   a. Identify those areas of work for which there are minority businesses, as requested.
   b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
   c. Assist in the determination of technical assistance needed by minority business contractors.

   In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:
   (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
   (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
   (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
   (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
   (5) The HUB Office also oversees the minority business program by:
      a. Monitoring compliance with the program requirements.
      b. Assisting in the implementation of training and technical assistance programs.
      c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
      d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office
   The State Construction Office will be responsible for the following:

   a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
      (1) Project description and location;
      (2) Locations where bidding documents may be reviewed;
      (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
      (4) Date, time and location of the bid opening.
      (5) Date, time and location of prebid conference, if scheduled.

   b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
d. Reviewing of minority business requirements at Preconstruction conference**.**
e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
f. Provide statistical data and required reports to the HUB Office.
g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner
Before awarding a contract, owner shall do the following:

a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
b. Attend the scheduled prebid conference.
c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
    1. A description of the work for which the bid is being solicited.
    2. The date, time, and location where bids are to be submitted.
    3. The name of the individual within the owner's organization who will be available to answer questions about the project.
    4. Where bid documents may be reviewed.
    5. Any special requirements that may exist.
d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment**.**
i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

e. During construction phase of the project, review "MBE Documentation for Contract Payment" – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
f. Make documentation showing evidence of implementation of Designer's responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors
Under the single-prime bidding, the separate-prime biding, construction manager at risk and alternative contracting methods, contractor(s) will:

a. Attend the scheduled prebid conference.
b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
   (1) A description of the work for which the subbid is being solicited.
   (2) The date, time and location where subbids are to be submitted.
   (3) The name of the individual within the company who will be available to answer questions about the project.
   (4) Where bid documents may be reviewed.
   (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

   If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.
d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
e. Identify on the bid**,** the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), "MBE Documentation for Contract Payment" – (Appendix E), for designer's review.
j. During the construction of a project, at any time**,** if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing**,** of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities
While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES
It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: http://www.nc-sco.com

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

(1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.

(2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.

(3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.

(4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

(5) Attending any prebid meetings scheduled by the public owner.

(6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.

(7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

(8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

(9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

(10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Social and Economically Disadvantage (D)

Date: _____ Approved/Certified By: _____
Name

_____
Title

_____
Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

(Revised on 3/14/2003)

SECTION 00 72 00 - GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

SUPPLEMENTARY CONDITIONS

2.01 REFER TO DOCUMENT 00 73 00 - SUPPLEMENTARY GENERAL CONDITIONS FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

INSTRUCTIONS TO BIDDERS

AND

GENERAL CONDITIONS OF THE CONTRACT

STANDARD FORM FOR CONSTRUCTION PROJECTS

STATE CONSTRUCTION OFFICE

NORTH CAROLINA

DEPARTMENT OF ADMINISTRATION

Form OC-15

This document is intended for use on State capital construction projects and shall not be used on any project that is not reviewed and approved by the State Construction Office. Extensive modification to the General Conditions by means of "Supplementary General Conditions" is strongly discouraged. State agencies and institutions may include special requirements in "Division 1 – General Requirements" of the specifications, where they do not conflict with the General Conditions.

Twenty Fourth Edition January 2013

INSTRUCTIONS TO BIDDERS

For a proposal to be considered it must be in accordance with the following instructions:

1. **PROPOSALS**

Proposals must be made in strict accordance with the Form of Proposal provided therefor, and all blank spaces for bids, alternates, and unit prices applicable to bidder's work shall be properly filled in. When requested alternates are not bid, the proposer shall so indicate by the words "No Bid". Any blanks shall also be interpreted as "No Bid".The bidder agrees that bid on Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Photocopied or faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates. If figures and writing differ, the written number will supersede the figures.

Any modifications to the Form of Proposal (including alternates and/or unit prices) will disqualify the bid and may cause the bid to be rejected.

The bidder shall fill in the Form of Proposal as follows:

a. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.

b. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

c. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.

d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable.

e. All signatures shall be properly witnessed.

f. If the contractor's license of a bidder is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the proposal. The title "Licensee" shall appear under his/her signature.

Proposals should be addressed as indicated in the Advertisement for Bids and be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders should clearly mark on the outside of the bid envelope which contract(s) they are bidding.

Bidder shall identify on the bid**,** the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or an affidavit indicating work under contract will be self-performed, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid.

For projects bid in the single-prime alternative, the names and license numbers of major subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the bidder to deliver his bid to the proper official at the selected place and prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delivery by any delivery service, shall disqualify the bid.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work. See General Conditions, Article 19c-1.

2. EXAMINATION OF CONDITIONS

It is understood and mutually agreed that by submitting a bid the bidder acknowledges that he has carefully examined all documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the work under the contract, and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications and other contract documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with other contractors performing work on the site.

Reference is made to contract documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the designer in preparing the documents. The owner will make copies of all such surveys and reports available to the bidder upon request.

Each bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the owner. Any reasonable request for access to the site will be honored by the owner.

3. BULLETINS AND ADDENDA

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in closing a contract they will become a part thereof. It shall be the bidder’s responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the bidder find discrepancies in, or omission from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the designer who will send written instructions in the form of addenda to all bidders. Notification should be no later than seven (7) days prior to the date set for receipt of bids. Neither the owner nor the designer will be responsible for any oral instructions.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal. However, even if not acknowledged, by submitting a bid, the bidder has certified that he has reviewed all issued addenda and has included all costs associated within his bid.

4. **BID SECURITY**

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a bid bond in an amount equal to not less than five percent (5%) of the proposal, said deposit to be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law (G.S. 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The owner may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the owner. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts, and no later then seven (7) days after expiration of the holding period stated in the Notice to Bidders. Standard Form of Bid Bond is included in these specifications and shall be used.

5. **RECEIPT OF BIDS**

Bids shall be received in strict accordance with requirements of the General Statutes of North Carolina. Bid security shall be required as prescribed by statute. Prior to the closing of the bid, the bidder will be permitted to change or withdraw his bid. Guidelines for opening of public construction bids are available from the State Construction Office.

6. **OPENING OF BIDS**

Upon opening, all bids shall be read aloud. Once bidding is closed, there shall not be any withdrawal of bids by any bidder and no bids may be returned by the designer to any bidder. After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default and fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The owner reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

a. If the Form of Proposal furnished to the bidder is not used or is altered.

b. If the bidder fails to insert a price for all bid items, alternate and unit prices requested.

c. If the bidder adds any provisions reserving the right to accept or reject any award.

d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.

e. If the bidder fails to complete the proposal form where information is requested so the bid may be properly evaluated by the owner.

f. If the unit prices contained in the bid schedule are unacceptable to the owner and the State Construction Office.

g. If the bidder fails to comply with other instructions stated herein.

7. **BID EVALUATION**

The award of the contract will be made to the lowest responsible bidder as soon as practical. The owner may award on the basis of the base bid and any alternates the owner chooses.

Before awarding a contract, the owner may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the owner.

b. A listing of completed projects of similar size.

c. Permanent name and address of place of business.

d. The number of regular employees of the organization and length of time the organization has been in business under present name.

e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.

f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.

g. If prequalified, contractor info will be reviewed and evaluated comparatively to submitted prequalification package.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of any bidder.

In determining the lowest responsible, responsive bidder, the owner shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c), the past performance of the bidder on construction contracts for the State with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and owner. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) shall constitute a basis for disqualification of the bid.

Should the owner adjudge that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned to him.

8. **PERFORMANCE BOND**

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

9. **PAYMENT BOND**

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

10. **PAYMENTS**

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates. See Article 31, General Conditions.

11. **PRE-BID CONFERENCE**

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

12. **SUBSTITUTIONS**

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

Submittals for proposed substitutions shall include the following information:

a. Name, address, and telephone number of manufacturer and supplier as appropriate.

b. Trade name, model or catalog designation.

c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.

d. Detailed comparison with specified products including performance capabilities, warranties, and test results.

e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum.

GENERAL CONDITIONS OF THE CONTRACT

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ARTICLE 1 - DEFINITIONS

a. The **contract documents** consist of the Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; the contract; the performance bond; the payment bond; insurance certificates; the approval of the attorney general; and the certificate of the Office of State Budget and Management. All of these items together form the contract.

b. The **owner** is the State of North Carolina through the agency named in the contract.

c. The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.

d. The **contractor**, as referred to hereinafter, shall be deemed to be either of the several contracting parties called the "Party of the First Part" in either of the several contracts in connection with the total project. Where, in special instances hereinafter, a particular contractor is intended, an adjective precedes the word "contractor," as "general," "heating," etc. For the purposes of a single prime contract, the term Contractor shall be deemed to be the single contracting entity identified as the “Party of the First Part” in the single Construction Contract. Any references or adjectives that name or infer multiple prime contractors shall be interpreted to mean the single prime Contractor.

e. A **subcontractor**, as the term is used herein, shall be understood to be one who has entered into a direct contract with a contractor, and includes one who furnishes materials worked to a special design in accordance with plans and specifications covered by the contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.

f. **Written notice** shall be defined as notice in writing delivered in person to the contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization by registered mail.

g. **Work**, as used herein as a noun, is intended to include materials, labor, and workmanship of the appropriate contractor.

h. The **project** is the total construction work to be performed under the contract documents by the several contractors.

i. **Project Expediter,** as used herein, is an entity stated in the contract documents, designated to effectively facilitate scheduling and coordination of work activities. See Article 14(f) for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime contractor shall be designated as the Project Expediter.**

j. **Change order**, as used herein, shall mean a written order to the contractor subsequent to the signing of the contract authorizing a change in the contract. The change order shall be signed by the contractor, designer and the owner, and approved by the State Construction Office, in that order (Article 19).

k. **Field Order,** as used herein, shall mean a written approval for the contractor to proceed with the work requested by owner prior to issuance of a formal Change Order. The field order shall be signed by the contractor, designer, owner, and State Construction Office.

l. **Time of completion**, as stated in the contract documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article 23).

m. **Liquidated damages,** as stated in the contract documents [, is an amount reasonably estimated in advance to cover the consequential damages associated with the Owner's economic loss in not being able to use the Project for its intended purposes at the end of the contract's completion date as amended by change order, if any, by reason of failure of the contractor(s) to complete the work within the time specified. Liquidated damages does not include the Owner's extended contract administration costs (including but not limited to additional fees for architectural and engineering services, testing services, inspection services, commissioning services, etc.), such other damages directly resulting from delays caused solely by the contractor, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused soley by the Contractor (e.g., if a multi-phased project-subsequent phases, delays in start other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).

n. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the contractor, and which engages to be responsible for the contractor and his acceptable performance of the work.

o. **Routine written communications between the Designer and the Contractor** are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, or facsimile. Such communications can not be identified as "request for information".

p. **Clarification or Request for information (RFI)** is a request from the Contractor seeking an interpretation or clarification by the Designer relative to the contract documents. The RFI, which shall be labeled (RFI), shall clearly and concisely set forth the issue or item requiring clarification or interpretation and why the response is needed. The RFI must set forth the Contractor's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.

q. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work**.**

r. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.

s. **"Equal to" or "approved equal"** shall mean materials, products, equipment, assemblies, or installation methods considered equal by the bidder in all characteristics (physical, functional, and aesthetic) to those specified in the contract documents. Acceptance of equal is subject to approval of Designer and owner.

t. **"Substitution" or "substitute"** shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified, but which in the opinion of the bidder would improve competition and/or enhance the finished installation. Acceptance of substitution is subject to the approval of the Designer and owner.

u. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.

v. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.

w. **Special inspector** is one who inspects materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and referenced standards.

x. **Commissioning** is a quality assurance process that verifies and documents that building components and systems operate in accordance to the owner's project requirements and the project design documents.

y. **Designer Final Inspection** is the inspection performed by the design team to determine the completeness of the project in accordance with approved plans and specifications. This inspection occurs prior to SCO final inspection.

z. **SCO Final Inspection** is the inspection performed by the State Construction Office to determine the completeness of the project in accordance with NC Building Codes and approved plans and specifications.

aa. **Beneficial Occupancy** is requested by the owner and is occupancy or partial occupancy of the building after all life safety items have been completed as determined by the State Construction Office. Life safety items include but not limited to fire alarm, sprinkler, egress and exit lighting, fire rated walls, egress paths and security.

bb. Final Acceptance is the date in which the State Construction Office accepts the construction as totally complete. This includes the SCO Final Inspection and certification by the designer that all punch lists are completed.

ARTICLE 2 - INTENT AND EXECUTION OF DOCUMENTS

a. The drawings and specifications are complementary, one to the other, and that which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a bid for a complete job. In case of discrepancy or disagreement in the contract documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.

b. The wording of the specifications shall be interpreted in accordance with common usage of the language except that words having a commonly used technical or trade meaning shall be so interpreted in preference to other meanings.

c. The contractor shall execute each copy of the proposal, contract, performance bond and payment bond as follows:

1. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.

2. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

3. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.

4. If the documents are made by a joint venture, they shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable to each particular member.

5. All signatures shall be properly witnessed.

6. If the contractor's license is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the contract. The title "Licensee" shall appear under his/her signature.

7. The bonds shall be executed by an attorney-in-fact. There shall be attached to each copy of the bond a certified copy of power of attorney properly executed and dated.

8. Each copy of the bonds shall be countersigned by an authorized individual agent of the bonding company licensed to do business in North Carolina. The title "Licensed Resident Agent" shall appear after the signature.

9. The seal of the bonding company shall be impressed on each signature page of the bonds.

10. The contractor's signature on the performance bond and the payment bond shall correspond with that on the contract. The date of performance and payment bond shall not be prior to the date of the contract.

ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS

a. In such cases where the nature of the work requires clarification by the designer, such clarification shall be furnished by the designer with reasonable promptness by means of written instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of contract documents, and shall become a part thereof.

b. The contractor(s) and the designer shall prepare, if deemed necessary, a schedule fixing dates upon which foreseeable clarifications will be required. The schedule will be subject to addition or change in accordance with progress of the work. The designer shall furnish drawings or clarifications in accordance with that schedule. The contractor shall not proceed with the work without such detail drawings and/or written clarifications.

ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS

The designer or Owner shall furnish free of charge to the contractors electronic copies of plans and specifications. If requested by the contractor, paper copies of plans and specifications shall be furnished free of charge as follows:

a. General contractor - Up to twelve (12) sets of general contractor drawings and specifications, up to six (6) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

b. Each other contractor - Up to six (6) sets of the appropriate drawings and specifications, up to three (3) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

c. Additional sets shall be furnished at cost, including mailing, to the contractor upon request by the contractor. This cost shall be stated in the bidding documents.

d. For the purposes of a single-prime contract, the contractor shall receive up to 30 sets of drawings and specifications, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

a. Within 15 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for submission of all shop drawings, product data, samples, and similar submittals through the Project Expediter to the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the designer.

b. The Contractor(s) shall review, approve and submit to the Designer all Shop Drawings, Coordination Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Required Submittals shall bear the Contractor's stamp of approval, any exceptions to the Contract Documents shall be noted on the submittals, and copies of all submittals shall be of sufficient quantity for the Designer to retain up to three (3) copies of each submittal for his own use plus additional copies as may be required by the Contractor. Submittals shall be presented to the Designer in accordance with the schedule submitted in paragraph (a). so as to cause no delay in the activities of the Owner or of separate Contractors.

c. The Designer shall review required submittals promptly, noting desired corrections if any, and retaining three (3) copies (1 for the Designer, 1 for the owner and 1 for SCO) for his use. The remaining copies of each submittal shall be returned to the Contractor not later than twenty (20) days from the date of receipt by the Designer, for the Contractor's use or for corrections and resubmittal as noted by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittal**s.**

d. Approval of shop drawings/submittals by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the shop drawings, unless such lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

a. The contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications for his work including all shop drawings. Such drawings and specifications shall be available for use by the designer, his authorized representative, owner or State Construction Office.

b. The contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the contractor and submitted to the designer upon project completion and no later than 30 days after final acceptance of the project.

c. The contractor shall maintain at the job office a record of all required tests that have been performed, clearly indicating the scope of work inspected and the date of approval or rejection.

ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All drawings and specifications are instruments of service and remain the property of the owner. The use of these instruments on work other than this contract without permission of the owner is prohibited. All copies of drawings and specifications other than contract copies shall be returned to the owner upon request after completion of the work.

ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES

a. The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.

b. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.

c. Upon notice, the contractor shall furnish evidence as to quality of materials.

d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.

e. The designer is the judge of equality for proposed substitution of products, materials or equipment.

g. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the owner or designer, or if any workman be considered detrimental to the work, the contractor shall order such parties removed immediately from grounds.

ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS

It is the intention of the contract documents that the work covered herein will not constitute in any way infringement of any patent whatsoever unless the fact of such patent is clearly evidenced herein. The contractor shall protect and save harmless the owner against suit on account of alleged or actual infringement. The contractor shall pay all royalties and/or license fees required on account of patented articles or processes, whether the patent rights are evidenced hereinafter.

ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS

a. The contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the designer in writing. See Instructions to Bidders, Paragraph 3, Bulletins and Addenda. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising therefrom. Additional requirements implemented after bidding will be subject to equitable negotiations.

b. All work under this contract shall conform to the North Carolina State Building Code and other State, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the contractor and included within the bid proposal. All water taps, meter barrels, vaults and impact fees shall be paid by the contractor unless otherwise noted.

d. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to inspection by any county or municipal authorities and are not subject to county or municipal building codes. The contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.

e. Projects involving local funding (community colleges) are subject also to county and municipal building codes and inspection by local authorities. The contractor shall pay the cost of these permits and inspections.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC

a. The contractors shall be jointly responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the owner or designer, and by laws or ordinances governing such conditions. They shall be responsible for any damage to the owner's property, or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times.

b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.

c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.

d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.

e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.

f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

g. The contractor shall designate a responsible person of his organization as safety officer/inspector to inspect the project site for unsafe health and safety hazards, to report these hazards to the contractor for correction, and whose duties also include accident prevention on the project, and to provide other safety and health measures on the project site as required by the terms and conditions of the contract.The name of the safety inspector shall be made known to the designer and owner at the time of the preconstruction conference and in all cases prior to any work starting on the project.

h. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage.

Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 19(b).

i. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973

a. Any land-disturbing activity performed by the contractor(s) in connection with the project shall comply with all erosion control measures set forth in the contract documents and any additional measures which may be required in order to ensure that the project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C).

b. Upon receipt of notice that a land-disturbing activity is in violation of said act, the contractor(s) shall be responsible for ensuring that all steps or actions necessary to bring the project in compliance with said act are promptly taken.

c. The contractor(s) shall be responsible for defending any legal actions instituted pursuant to N.C.G.S. 113A-64 against any party or persons described in this article.

d. To the fullest extent permitted by law, the contractor(s) shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of work or failure of performance of work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article.

ARTICLE 13 - INSPECTION OF THE WORK

a. It is a condition of this contract that the work shall be subject to inspection during normal working hours and during any time work is in preparation and progress by the designer, designated official representatives of the owner, State Construction Office and those persons required by state law to test special work for official approval. The contractor shall therefore provide safe access to the work at all times for such inspections.

b. All instructions to the contractor will be made only by or through the designer or his designated project representative. Observations made by official representatives of the owner shall be conveyed to the designer for review and coordination prior to issuance to the contractor.

c. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. Contractor shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first reinspection all costs associated with additional reinspections shall be borne by the contractor.

d. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.

e. All laboratory tests shall be paid by the owner unless provided otherwise in the contract documents except the general contractor shall pay for laboratory tests to establish design mix for concrete, and for additional tests to prove compliance with contract documents where materials have tested deficient except when the testing laboratory did not follow the appropriate ASTM testing procedures.

f. Should any work be covered up or concealed prior to inspection and approval by the designer, special inspector, and/or State Construction Office such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the contractor involved.

ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE

a. Throughout the progress of the work, each contractor shall keep at the job site**,** a competent superintendent and supervisory staff satisfactory to the designer and the owner. The superintendent and supervisory staff shall not be changed without the consent of the designer and owner unless said superintendent ceases to be employed by the contractor or ceases to be competent as determined by the contractor, designer or owner. The superintendent and other staff designated by the contractor in writing shall have authority to act on behalf of the contractor, and instructions, directions or notices given to him shall be as binding as if given to the contractor. However, directions, instructions, and notices shall be confirmed in writing.

b. The contractor shall examine and study the drawings and specifications and fully understand the project design, and shall provide constant and efficient supervision to the work. Should he discover any discrepancies of any sort in the drawings or specifications, he shall report them to the designer without delay. He will not be held responsible for discrepancies in the drawings and/or specifications, but shall be held responsible to report them should they become known to him.

c. All contractors shall be required to cooperate and consult with each other during the construction of this project. Prior to installation of work, all contractors shall jointly prepare coordination drawings, showing locations of various ductworks, piping, motors, pumps, and other mechanical or electrical equipment, in relation to the structure, walls and ceilings. These drawings shall be submitted to the designer through the Project Expediter for information only**.** Each contractor shall lay out and execute his work to cause the least delay to other contractors. Each contractor shall be financially responsible for any damage to other contractor's work and for undue delay caused to other contractors on the project.

d. The contractor is required to attend job site progress conferences as called by the designer. The contractor shall be represented at these job progress conferences by both home office and project personnel. These representatives shall have authority to act on behalf of the contractor. These meetings shall be open to subcontractors, material

suppliers and any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the project on schedule and to complete the project within the specified contract time. Each contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman. The contractor shall turn over a copy of his daily reports to the Designer and Owner at the job site progress conference. Owner will determine daily report format.

e The contractor(s) shall, employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a bench mark in a location where same will not be disturbed and where direct instruments sights may be taken.

f. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be designated in the Supplementary General Conditions. The Project Expediter shall have at a minimum the following responsibilities.

1. Prepare the project construction schedule and shall allow all prime contractors (multi-prime contract) and subcontractors (single-prime contract) performing general, plumbing, HVAC, and electrical work equal input into the preparation of the initial construction schedule.

2. Maintain a project progress schedule for all contractors.

3. Give adequate notice to all contractors to ensure efficient continuity of all phases of the work.

4. Notify the designer of any changes in the project schedule.

5. Recommend to the owner whether payment to a contractor shall be approved.

g. It shall be the responsibility of the Project Expediter to cooperate with and obtain from several prime contractors and subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A "work activity", for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill. The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the contractor's early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order. On a multi-prime project, each prime contractor shall review the proposed construction schedule and approve same in writing. The Project Expediter shall submit the proposed construction schedule to the designer for comments. The complete Project construction schedule shall be of the type set forth in the Supplementary General Condition or subparagraph (1) or (2) below, as appropriate:

1. For a project with total contracts of $500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the work.

2. For a project with total contracts over $500,000, a Critical Path Method (CPM) schedule shall be utilized to control the planning and scheduling of the Work. The CPM schedule shall be the responsibility of the Project Expediter and shall be paid for by the Project Expediter.

Bar Chart Schedule: Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submission of shop drawings and other Submittals for approval, approval of shop drawings by designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

CPM Schedule: Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s).. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over $2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

Early Completion of Project: The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time

for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

h. The proposed project construction schedule shall be presented to the designer no later than fifteen (15) days after written notice to proceed. No application for payment will be processed until this schedule is accepted by the designer and owner.

i. The approved project construction schedule shall be distributed to all contractors and displayed at the job site by the Project Expediter.

j. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the project construction schedule, making biweekly adjustments, updates, corrections, etc., that are necessary to finish the project within the Contract time, keeping all contractors and the designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the designer, along with monthly request for payment. For project requiring CPM schedule, the Contractor shall submit a biweekly report of the status of all activities. The bar chart schedule or status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the work of several contractors are behind schedule, the contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the designer by the Project Expediter, when (1) the contractor's report indicates delays, that are in the opinion of the designer or the owner, of sufficient magnitude that the contractor's ability to complete the work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions, as determined by the Designer, are in process; and (3) the contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the designer or the owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment applications or withholding of funds as set forth in Article 33.

k. The Project Expediter shall notify each contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the contractor(s) responsible for such delay, the designer, the State Construction Office and other prime contractors. The designer shall determine the contractor(s) who caused the delays and notify the bonding company of the responsible contractor(s) of the delays; and shall make a recommendation to the owner regarding further action.

l. Designation as Project Expediter entails an additional project control responsibility and does not alter in any way the responsibility of the contractor so designated, nor the

responsibility of the other contractors involved in the project. The project expeditor's Superintendent(s) shall be in attendance at the Project site at all times when work is in progress unless conditions are beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such Superintendent shall be acceptable to the Owner and Designer and shall be the one who will be continued in that capacity for the duration of the project unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The Superintendent shall not be employed on any other project for or by the Contractor or by any other entity during the course of the Work. If the Superintendent is employed by the Contractor on another project without the Owner's approval, then the Owner may deduct from the Contractor's monthly general condition costs and amount representing the Superintendent's cost and shall deduct that amount for each month thereafter until the Contractor has the Superintendent back on the Owner's Project full-time.

ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

a. Effective from January 1, 2002, Chapter 143, Article 8, was amended, to allow public contracts to be delivered by the following delivery methods: single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The owner reserves the right to prepare separate specifications, receive separate bids, and award separate contracts for such other major items of work as may be in the best interest of the State. For the purposes of a single prime contract, refer to Article 1 – Definitions.

b. All contractors shall cooperate with each other in the execution of their work, and shall plan their work in such manner as to avoid conflicting schedules or delay of the work. See Article 14, Construction Supervision.

c. If any part of contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the designer in order that prompt inspection may be made and the defects corrected. Commencement of work by a contractor where such condition exists will constitute acceptance of the other contractor's work as being satisfactory in all respects to receive the work commenced, except as to defects which may later develop. The designer shall be the judge as to the quality of work and shall settle all disputes on the matter between contractors.

d. Any mechanical or electrical work such as sleeves, inserts, chases, openings, penetrations, etc., which is located in the work of the general contractor shall be built in by the general contractor. The respective mechanical and electrical contractors shall set all sleeves, inserts and other devices that are to be incorporated into the structure in cooperation and under the supervision of the general contractor. The responsibility for the exact location of such items shall be that of the mechanical and/or electrical contractor.

e. The designer and the owner shall have access to the work whenever it is in preparation and progress and during normal working hours. The contractor shall provide facilities for such access so the designer may perform his functions under the contract documents.

f. Should a contractor cause damage to the work or property of another contractor, he shall be directly responsible, and upon notice, shall promptly settle the claim or otherwise resolve the dispute.

ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS

a. Within thirty (30) days after award of the contract, the contractor shall submit to the designer, owner and to the State Construction Office a list giving the names and addresses of subcontractors and equipment and material suppliers he proposes to use, together with the scope of their respective parts of the work. Should any subcontractor be disapproved by the designer or owner, the designer or owner shall submit his reasons for disapproval in writing to the State Construction Office for its consideration with a copy to the contractor. If the State Construction Office concurs with the designer's or owner's recommendation, the contractor shall submit a substitute for approval. The designer and owner shall act promptly in the approval of subcontractors, and when approval of the list is given, no changes of subcontractors will be permitted except for cause or reason considered justifiable by the designer or owner.

b. The designer will furnish to any subcontractor, upon request, evidence regarding amounts of money paid to the contractor on account of the subcontractor's work.

c. The contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.

d. The owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

The contractor agrees that the terms of these contract documents shall apply equally to each subcontractor as to the contractor, and the contractor agrees to take such action as may be necessary to bind each subcontractor to these terms. The contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to contractor-subcontractor relationships, and that payments to subcontractors shall be made in accordance with the provisions of G.S. 143-134.1 titled Interest on final payments due to prime contractors: payments to subcontractors.

a. On all public construction contracts which are let by a board or governing body of the state government or any political subdivision thereof, except contracts let by the Department of Transportation pursuant to G.S. 136-28.1, the balance due prime contractors shall be paid in full within 45 days after respective prime contracts of the project have been accepted by the owner, certified by the architect, engineer or designer to be completed in accordance with terms of the plans and specifications, or occupied by the owner and used for the purpose for which the project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting engineer in charge of the project determines that delay in completion of the project in accordance with terms of the plans and specifications is the fault of the contractor, the project may be occupied and used for the purposes for which it was constructed without payment of any interest on amounts withheld past the 45 day limit. No payment shall be delayed because of the failure of another prime contractor on such project to complete his contract. Should final payment to any prime contractor beyond the date such contracts have been certified to be completed by the designer or architect, accepted by the owner, or occupied by the owner and used for the purposes for which the project was constructed, be delayed by more than 45 days, said prime contractor shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is

agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due a prime contractor during construction shall be paid in accordance with the payment provisions of the contract documents or said prime contractor shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the contract. Funds for payment of such interest on state-owned projects shall be obtained from the current budget of the owning department, institution or agency. Where a conditional acceptance of a contract exists, and where the owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

b. Within seven days of receipt by the prime contractor of each periodic or final payment, the prime contractor shall pay the subcontractor based on work completed or service provided under the subcontract. Should any periodic or final payment to the subcontractor be delayed by more than seven days after receipt of periodic or final payment by the prime contractor, the prime contractor shall pay the subcontractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due.

c. The percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the owner to the prime contractor. Any percentage of retainage on payments made by the prime contractor to the subcontractor that exceeds the percentage of retainage on payments made by the owner to the prime contractor shall be subject to interest to be paid by the prime contractor to the subcontractor at the rate of one percent (1%) per month or fraction thereof.

d. Nothing in this section shall prevent the prime contractor at the time of application and certification to the owner from withholding application and certification to the owner for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment and materials; damage to prime contractor or another subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by owner.

ARTICLE 18 - DESIGNER'S STATUS

a. The designer shall provide general administration of the performance of construction contracts, including liaison and necessary inspection of the work to ensure compliance with plans and specifications. He is the agent of the owner only for the purpose of constructing this work and to the extent stipulated in the contract documents. He has authority to direct work to be performed, to stop work, to order work removed, or to order corrections of faulty work, where any such action by the designer may be necessary to assure successful completion of the work.

b. The designer is the impartial interpreter of the contract documents, and, as such, he shall exercise his powers under the contract to enforce faithful performance by both the owner and the contractor, taking sides with neither.

c. Should the designer cease to be employed on the work for any reason whatsoever, then the owner shall employ a competent replacement who shall assume the status of the former designer.

d. The designer and his consultants will make inspections of the project. He will inspect the progress, the quality and the quantity of the work.

e. The designer and the owner shall have access to the work whenever it is in preparation and progress during normal working hours. The contractor shall provide facilities for such access so the designer and owner may perform their functions under the contract documents.

f. Based on the designer's inspections and evaluations of the project, the designer shall issue interpretations, directives and decisions as may be necessary to administer the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract.

ARTICLE 19 - CHANGES IN THE WORK

a. The owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.

b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order or written field order from the designer, countersigned by the owner and the state construction office authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed.

A field order, transmitted by fax, electronically, or hand delivered, may be used where the change involved impacts the critical path of the work. A formal change order shall be issued as expeditiously as possible.

In the event of emergency endangering life or property, the contractor may be directed to proceed on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the designer or owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "c(1)" or Method "c(2)" or both.

c. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:

1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, Owner and State Construction Office the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except is such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph c2 herein. If neither party elects to proceed under c2, then unit prices shall apply.

2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

d. Under Paragraph “b” and Methods "c(2)" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc contractors shall be allowed a maximum of 2.5% on the contracted workof their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.

e. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:

1. The actual costs of materials and supplies incorporated or consumed as part of the work;

2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.

3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker’s compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;

4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;

5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the work.

Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the owner.

f. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.

g. In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor’s accepted proposal including all supporting documentation required by the designer, the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to

the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order and forward to the State Construction Office for final approval**,** within seven (7) days of receipt. The State Construction Office shall act on the change order within seven (7) days. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or field orders approved by all parties, then shall be substantiated in writing as outlined under normal procedure.

h. At the time of signing a change order, the contractor shall be required to certify as follows:

"I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

i. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.

j. If, during the progress of the work, the owner requests a change order and the contractor's terms are unacceptable, the owner**,** with the approval of the State Construction Office, may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. above. Without prejudice, nothing in this paragraph shall preclude the owner from performing or to have performed that portion of the work requested in the change order.

ARTICLE 20 - CLAIMS FOR EXTRA COST

a. Should the contractor consider that as a result of instructions given by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The contractor shall not proceed with the work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article 19(b) and Article 11(h). No claims for extra compensation shall be considered unless the claim is so made. The designer shall render a written decision within seven (7) days of receipt of claim.

b. The contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.

c. Should a claim for extra compensation that complies with the requirements of (a) above by the contractor and is denied by the designer or owner, and cannot be resolved by a

representative of the State Construction Office, the contractor may request a mediation in connection with GS 143-128(f1) in the dispute resolution rules adopted by the State Building Commission (1 N.C.A.C. 30H .0101 through .1001). If the contractor is unable to resolve its claim as a result of mediation, the contractor may pursue the claim in accordance with the provisions of G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner,and the following:

1. A contractor who has not completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The director may deny, allow or compromise the claim, in whole or in part. A claim under this subsection is not a contested case under Chapter 150B of the General Statutes.

2. (a) A contractor who has completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The claim shall be submitted within sixty (60) days after the contractor receives a final statement of the board's disposition of his claim and shall state the factual basis for the claim.

   (b) The director shall investigate a submitted claim within ninety (90) days of receiving the claim, or within any longer time period upon which the director and the contractor agree. The contractor may appear before the director, either in person or through counsel, to present facts and arguments in support of his claim. The director may allow, deny or compromise the claim, in whole or in part. The director shall give the contractor a written statement of the director's decision on the contractor's claim.

   (c) A contractor who is dissatisfied with the director's decision on a claim submitted under this subsection may commence a contested case on the claim under Chapter 150B of the General Statutes. The contested case shall be commenced within sixty (60) days of receiving the director's written statement of the decision.

   (d) As to any portion of a claim that is denied by the director, the contractor may, in lieu of the procedures set forth in the preceding subsection of this section, within six (6) months of receipt of the director's final decision, institute a civil action for the sum he claims to be entitled to under the contract by filing a verified complaint and the issuance of a summons in the Superior Court of Wake County or in the superior court of any county where the work under the contract was performed. The procedure shall be the same as in all civil actions except that all issues shall be tried by the judge, without a jury.

ARTICLE 21 - MINOR CHANGES IN THE WORK

The designer will have the authority to order minor changes in the work not involving an adjustment in the contract sum or time for completion, and not inconsistent with the intent of the contract documents. Such changes shall be effected by written order, copied to the State Construction Office, and shall be binding on the owner and the contractor.

ARTICLE 22 - UNCORRECTED FAULTY WORK

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the owner and the designer, the owner shall be reimbursed by the contractor. A change order will be issued to reflect a reduction in the contract sum.

ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

a. The time of completion is stated in the Supplementary General Conditions and in the Form of Construction Contract. The Project Expediter, upon notice of award of contract, shall prepare a construction schedule to complete the project within the time of completion as required by Article 14.

b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the designer and shall fully complete all work hereunder within the time of completion stated. Time is of the essence and the contractor acknowledges the Owner will likely suffer financial damage for failure to complete the work within the time of completion. For each day in excess of the above number of days, the contractor(s) shall pay the owner the sum stated as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of said contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.

c. In the event of multiple prime contractors, the designer shall be the judge as to the division of responsibility between the contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.

d. If the contractor is delayed at any time in the progress of his work solely by any act or negligence of the owner, the designer, or by any employee of either; by any separate contractor employed by the owner; by changes ordered in the work; by labor disputes at the project site; by abnormal weather conditions not reasonably anticipated for the locality where the work is performed; by unavoidable casualties; by any causes beyond the contractor's control; or by any other causes which the designer and owner determine may justify the delay, then the contract time may be extended by change order only for the time which the designer and owner may determine is reasonable.

   Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the contractor reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

e. Request for extension of time shall be made in writing to the designer, copies to the owner and SCO, within twenty (20) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the_Designer to the designer, copies to the owner and SCO, of the delay within 20 days of the beginning of the delay and only one claim is necessary.

f. The contractor shall notify his surety in writing of extension of time granted.

g. No claim for time extension shall be allowed on account of failure of the designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. See Article 5c. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY

a. The owner may desire to occupy or utilize all or a portion of the project prior to the completion of the project.

b. Should the owner request a utilization of a building or portion thereof, the designer shall perform a designer final inspection of area after being notified by the contractor that the area is ready for such. After the contractor has completed designer final inspection punch list and the designer has verified, then the designer shall schedule a beneficial occupancy inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office. If beneficial occupancy is granted by the State Construction Office, in such areas the following will be established:

1. The beginning of guarantees and warranties period for the equipment necessary to support. in the area.

2. The owner assumes all responsibiliites for utility costs for entire building.

2. Contractor will obtain consent of surety.

3. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.

c. The owner shall have the right to exclude the contractor from any part of the project which the designer has so certified to be substantially complete, but the owner will allow the contractor reasonable access to complete or correct work to bring it into compliance with the contract.

d. Occupancy by the owner under this article will in no way relieve the contractor from his contractual requirement to complete the project within the specified time. The contractor will not be relieved of liquidated damages because of beneficial occupancy. The designer may prorate liquidated damages based on the percentage of project occupied.

ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

a. Upon notification from the contractor(s) that the project is complete and ready for inspection, the designer shall make a Designer final inspection to verify that the project is complete and ready for SCO final inspection. Prior to SCO final inspection, the contractor(s) shall complete all items requiring corrective measures noted at the Designer

final inspection. The designer shall schedule a SCO final inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office.

b. At the SCO final inspection, the designer and his consultants shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the SCO final inspection, the designer and State Construction Office representative shall make one of the following determinations:

1. That the project is completed and accepted.

2. That the project will be accepted subject to the correction of the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of SCO final inspection or the owner may invoke Article 28, Owner's Right to Do Work.

4. That the project is not complete and another date for a SCO final inspection will be established.

c. Within fourteen (14) days of final acceptance per Paragraph b1 or within fourteen (14) days after completion of punch list per Paragraph b2 above, the designer shall certify the work and issue applicable certificate(s) of compliance.

d. Any discrepancies listed or discovered after the date of SCO final inspection and acceptance under Paragraphs b1 or b2 above shall be handled in accordance with Article 42, Guarantee.

f. The final acceptance date will establish the following:

1. The beginning of guarantees and warranties period.

2. The date on which the contractor's insurance coverage for public liability, property damage and builder's risk may be terminated.

3. That no liquidated damages (if applicable) shall be assessed after this date.

4. The termination date of utility cost to the contractor.

g. Prior to issuance of final acceptance date, the contractor shall have his authorized representatives visit the project and give full instructions to the designated personnel regarding operating, maintenance, care, and adjustment of all equipment and special construction elements. In addition, the contractor shall provide to the owner a complete instructional video (media format acceptable to the owner) on the operation, maintenance, care and adjustment of all equipment and special construction elements.

ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT

a. Any work, materials, fabricated items or other parts of the work which have been condemned or declared not in accordance with the contract by the designer shall be promptly removed from the work site by the contractor, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the owner. Work or property of other contractors or the owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the contractor whose work is faulty.

b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the designer, and shall make satisfactory progress, as determined by the designer, until completed.

c. Should the contractor fail to proceed with the required corrections, then the owner may complete the work in accordance with the provisions of Article 28.

ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT

See Article 35, Performance Bond and Payment Bond, and Article 42, Guarantee**.** Neither the final certificate, final payment, occupancy of the premises by the owner, nor any provision of the contract, nor any other act or instrument of the owner, nor the designer, shall relieve the contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. Contractor shall correct or make good any defects due thereto and repair any damage resulting there from, which may appear during the guarantee period following final acceptance of the work except as stated otherwise under Article 42, Guarantee. The owner will report any defects as they may appear to the contractor and establish a time limit for completion of corrections by the contractor. The owner will be the judge as to the responsibility for correction of defects.

ARTICLE 28 - OWNER'S RIGHT TO DO WORK

If, during the progress of the work or during the period of guarantee, the contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

ARTICLE 29 - ANNULMENT OF CONTRACT

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time above specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety of such delay, neglect or default, specifying the same, and if the contractor within a period of seven (7) days after such notice shall not proceed in accordance therewith, then the owner shall, declare this contract in default, and, thereupon, the surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the surety shall fail to take over the work to be done under this contract within seven (7) days after being so notified and notify the owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the owner shall have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and provisions thereof

or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said contractor and surety. In case the expense so incurred by the owner shall be less than the sum which would have been payable under the contract, if it had been completed by said contractor, then the said contractor and surety shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the contractor and the surety shall be liable and shall pay to the owner the amount of said excess.

ARTICLE 30 - CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT

a. Should the work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three months, due to cause beyond the fault or control of the contractor, or if the owner should fail or refuse to make payment on account of a certificate issued by the designer within forty-five (45) days after receipt of same, then the contractor, after fifteen (15) days' written notice sent by certified mail, return receipt requested, to the owner and the designer, may suspend operations on the work or terminate the contract.

b. The owner shall be liable to the contractor for the cost of all materials delivered and work performed on this contract plus 10 percent overhead and profit and shall make such payment. The designer shall be the judge as to the correctness of such payment.

ARTICLE 31 - REQUEST FOR PAYMENT

a. Not later than the fifth day of the month, the contractor shall submit to the designer a request for payment for work done during the previous month. The request shall be in the form agreed upon between the contractor and the designer, but shall show substantially the value of work done and materials delivered to the site during the period since the last payment, and shall sum up the financial status of the contract with the following information:

    1. Total of contract including change orders.

    2. Value of work completed to date.

    3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the contractor’s work has been satisfactorily completed on schedule, with approval of the owner and the State Construction Office and written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule.

    4. Less previous payments.

    5. Current amount due.

b. The contractor, upon request of the designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.

c. Prior to submitting the first request, the contractor shall prepare for the designer a schedule showing a breakdown of the contract price into values of the various parts of the work, so arranged as to facilitate payments to subcontractors in accordance with Article 17, Contractor and Subcontractor Relationships. The contractor(s) shall list the

value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

d. When payment is made on account of stored materials and equipment, such materials must be stored on the owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the owner's title to such materials and equipment. Such payments will be made only for materials that have been customized or fabricated specifically for this project. Raw materials or commodity products including but not limited to piping, conduit, CMU, metal studs and gypsum board may not be submitted. Responsibility for such stored materials and equipment shall remain with the contractor regardless of ownership title. Such stored materials and equipment shall not be removed from the owner's property. Should the space for storage on-site be limited, the contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the contractor desire to include any such materials or equipment in his application for payment, they must be stored in the name of the owner in an independent, licensed, bonded warehouse approved by the designer, owner and the State Construction Office and located as close to the site as possible. The warehouse selected must be approved by the contractor's bonding and insurance companies; the material to be paid for shall be assigned to the owner and shall be inspected by the designer. Upon approval by the designer, owner and SCO of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the contractor. Such stored materials and equipment shall not be moved except for transportation to the project site. Under certain conditions, the designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the designer, the owner and the State Construction Office prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the State absolute right to possession of the materials at anytime. Bond, security and insurance protection shall continue to be the responsibility of the contractor(s).

e. In the event of beneficial occupancy, retainage of funds due the contractor(s) may be reduced with the approval of the State Construction Office to an equitable amount to cover the list of items to be completed or corrected. Retainage may not be reduced to less than two and one-half (2 1/2) times the estimated value of the work to be completed or corrected. Reduction of retainage must be with the consent and approval of the contractor's bonding company.

ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT

a. Within five (5) days from receipt of request for payment from the contractor, the designer shall issue and forward to the owner a certificate for payment. This certificate shall indicate the amount requested or as approved by the designer. If the certificate is not approved by the designer, he shall state in writing to the contractor and the owner his reasons for withholding payment.

b. No certificate issued or payment made shall constitute an acceptance of the work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the owner except:

1. Claims arising from unsettled liens or claims against the contractor.

2. Faulty work or materials appearing after final payment.

3. Failure of the contractor to perform the work in accordance with drawings and specifications, such failure appearing after payment.

4. As conditioned in the performance bond and payment bond.

c. The making and acceptance of final payment shall constitute a waiver of all claims by the contractor except those claims previously made and remaining unsettled (Article 20(c)).

d. Prior to submitting request for final payment to the designer for approval, the contractor shall fully comply with all requirements specified in the" project closeout" section of the specifications. These requirements include but not limited to the following:

1. Submittal of Product and Operating Manuals, Warranties and Bonds, Guarantees, Maintenance Agreements, As-Built Drawings, Certificates of Inspection or Approval from agencies having jurisdiction. (The designer must approve the Manuals prior to delivery to the owner).

2. Transfer of Required attic stock material and all keys in an organized manner.

3. Record of Owner's training.

4. Resolution of any final inspection discrepancies.

5. Granting access to Contractor's records, if Owner's internal auditors have made a request for such access pursuant to Article 52.

e. The contractor shall forward to the designer, the final application for payment along with the following documents:

1. List of minority business subcontractors and material suppliers showing breakdown of contract amounts and total actual payments to subs and material suppliers.

2. Affidavit of Release of Liens.

3. Affidavit of contractors of payment to material suppliers and subcontractors. (See Article 36).

4. Consent of Surety to Final Payment**.**

5. Certificates of state agencies required by state law.

f. The designer will not authorize final payment until the work under contract has been certified by designer, certificates of compliance issued, and the contractor has complied with the closeout requirements. The designer shall forward the contractor's final application for payment to the owner along with respective certificate(s) of compliance required by law.

ARTICLE 33 - PAYMENTS WITHHELD

a. The designer with the approval of the State Construction Office may withhold payment for the following reasons:

1. Faulty work not corrected.

2. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.

3. To provide for sufficient contract balance to cover liquidated damages that will be assessed.

b. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:

1. Claims filed against the contractor or evidence that a claim will be filed.

2. Evidence that subcontractors have not been paid.

c. The Owner may withhold all or a portion of Contractor's general conditions costs set forth in the approved schedule of values, if Contractor has failed to comply with: (1) a request to access its records by Owner's internal auditors pursuant to Article 52; (2) a request for a plan of action and/or recovery schedule under Article 14.j or provide The Owner; (3) a request to provide an electronic copies of Contractor's baseline schedule, updates with all logic used to create the schedules in the original format of the scheduling software; and (4) Contractor's failure to have its Superintendent on the Project full-time; (

d. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the contractor without cause will make owner liable for payment of interest to the contractor in accordance with G.S. 143-134.1. As provided in G.S.143-134.1(e) the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progess, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS

The work under this contract shall not commence until the contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

a. **Worker's Compensation and Employer's Liability**

The contractor shall provide and maintain, until final acceptance, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of $100,000.

b. **Public Liability and Property Damage**

The contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor, or by

anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

Bodily Injury:	$500,000 per occurrence
Property Damage:	$100,000 per occurrence / $300,000 aggregate

In lieu of limits listed above, a $500,000 combined single limit shall satisfy both conditions.

Such coverage for completed operations must be maintained for at least two (2) years following final acceptance of the work performed under the contract.

c. **Property Insurance (Builder's Risk/Installation Floater)**

The contractor shall purchase and maintain property insurance until final acceptance, upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the owner, the contractor, the subcontractors and sub-subcontractors in the work and shall insure against the perils of fire, wind, rain, flood, extended coverage, and vandalism and malicious mischief. If the owner is damaged by failure of the contractor to purchase or maintain such insurance, then the contractor shall bear all reasonable costs properly attributable thereto; the contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so includes such portions.

d. **Deductible**

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the contractor.

e. **Other Insurance**

The contractor shall obtain such additional insurance as may be required by the owner or by the General Statutes of North Carolina including motor vehicle insurance, in amounts not less than the statutory limits.

f. **Proof of Carriage**

The contractor shall furnish the owner with satisfactory proof of carriage of the insurance required before written approval is granted by the owner.

ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND

a. Each contractor shall furnish a performance bond and payment bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications.

b. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina.

ARTICLE 36 - CONTRACTOR'S AFFIDAVIT

The final payment of retained amount due the contractor on account of the contract shall not become due until the contractor has furnished to the owner through the designer an affidavit signed, sworn and notarized to the effect that all payments for materials, services or subcontracted work in connection with his contract have been satisfied, and that no claims or

liens exist against the contractor in connection with this contract. In the event that the contractor cannot obtain similar affidavits from subcontractors to protect the contractor and the owner from possible liens or claims against the subcontractor, the contractor shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the contractor's) knowledge, and if any appear afterward, the contractor shall save the owner harmless.

ARTICLE 37 - ASSIGNMENTS

The contractor shall not assign any portion of this contract nor subcontract in its entirety. Except as may be required under terms of the performance bond or payment bond, no funds or sums of money due or become due the contractor under the contract may be assigned.

ARTICLE 38 - USE OF PREMISES

a. The contractor(s) shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the designer and owner and shall not exceed those established limits in his operations.

b. The contractor(s) shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

c. The contractor(s) shall enforce the designer's and owner’s instructions regarding signs, advertisements, fires and smoking.

d. No firearms, any type of alcoholic beverages, or drugs (other than those prescribed by a physician) will be permitted at the job site.

ARTICLE 39 - CUTTING, PATCHING AND DIGGING

a. The contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the drawings and specifications for the completed structure, as the designer may direct.

b. Any cost brought about by defective or ill-timed work shall be borne by the party responsible therefor.

c. No contractor shall endanger any work of another contractor by cutting, digging or other means. No contractor shall cut or alter the work of any other contractor without the consent of the designer and the affected contractor(s).

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

a. The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer and other utility services which maybe necessary and required for completion of the project including all utilities required for testing, cleaning, balancing, and sterilization of designated plumbing, mechanical and electrical systems. Any permanent meters installed shall be listed in the contractor’s name until work has a final acceptance. The contractor will be solely responsible for all utility costs prior to final acceptance. Contractor shall contact all affected utility companies prior to bid to determine their requirements to provide temporary and permanent service and include all costs associated with providing those services in their bid. Coordination of the work of the utility companies during construction is the sole responsibility of the contractor.

b. Meters shall be relisted in the owner's name on the day following final acceptance of the Project Expediter's work, and the owner shall pay for services used after that date.

c. The owner shall be reimbursed for all metered utility charges after the meter is relisted in the owner's name and prior to completion and acceptance of the work of **all** contractors. Reimbursement shall be made by the contractor whose work has not been completed and accepted. If the work of two or more contractors has not been completed and accepted, reimbursement to the owner shall be paid by the contractors involved on the basis of assessments by the designer.

d Prior to the operation of permanent systems, the Project Expediter will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.

e. All contractors shall have the permanent building systems in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishes of the building. A building shall be considered enclosed and secured when windows**,** doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed**;** and other openings have protection which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the contractor(s), the designer and owner. Use of the equipment in this manner shall be subject to the approval of the Designer and owner and shall in no way affect the warranty requirements of the contractor(s).

f. The electrical contractor shall have the building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.

g. The electrical contractor shall have the building's permanent lighting system ready at the time the general contractor begins interior painting and shall provide adequate lighting in those areas where interior painting and finishing is being performed.

h. Each prime contractor shall be responsible for his permanently fixed service facilities and systems in use during progress of the work. The following procedures shall be strictly adhered to:

1. Prior to final acceptance of work by the State Construction Office, each contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.

2. Temporary filters as recommended by the equipment manufacturer in order to keep the equipment and ductwork clean and free of dust and debris shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the owner's acceptance of the work.

3. Extra effort shall be maintained to keep the building and the site adjacent to the building clean and under no circumstances shall air systems be operated if finishing and site work operations are creating dust in excess of what would be considered normal if the building were occupied.

4. It shall be understood that any warranty on equipment presented to the owner shall extend from the day of final acceptance by the owner. The cost of warranting the

equipment during operation in the finishing stages of construction shall be borne by the contractor whose system is utilized.

5. The electrical contractor shall have all lamps in proper working condition at the time of final project acceptance.

i. The Project Expediter shall provide, if required and where directed, a shed for toilet facilities and shall furnish and install in this shed all water closets required for a complete and adequate sanitary arrangement. These facilities will be available to other contractors on the job and shall be kept in a neat and sanitary condition at all times. Chemical toilets are acceptable.

j. The Project Expediter shall, if required by the Supplementary General Conditions and where directed, erect a temporary field office, complete with lights, telephone, heat and air conditioning. A portion of this office shall be partitioned off, of sufficient size, for the use of a resident inspector, should the designer so direct.

k. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.

l. The Project Expediter will erect one sign on the project if required. The sign shall be of sound construction, and shall be neatly lettered with black letters on white background. The sign shall bear the name of the project, and the names of prime contractors on the project, and the name of the designer and consultants. Directional signs may be erected on the owner's property subject to approval of the owner with respect to size, style and location of such directional signs. Such signs may bear the name of the contractor and a directional symbol. No other signs will be permitted except by permission of the owner.

ARTICLE 41 - CLEANING UP

a. The contractors shall keep the building and surrounding area reasonably free from rubbish at all times, and shall remove debris from the site on a timely basis or when directed to do so by the designer or Project Expediter. The Project Expediter shall provide an on site refuse container(s) for the use of all contractors. Each contractor shall remove their rubbish and debris from the building on a daily basis. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.

b. The Project Expediter shall provide and maintain suitable all-weather access to the building.

c. Before final inspection and acceptance of the building, each contractor shall clean his portion of the work, including glass, hardware, fixtures, masonry, tile and marble (using no acid), clean and wax all floors as specified, and completely prepare the building for use by the owner, with no cleaning required by the owner.

ARTICLE 42 - GUARANTEE

a. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the date of final acceptance of the work or beneficial occupancy and shall replace such defective materials or workmanship without cost to the owner.

b. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.

c. Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

d. Guarantees for roof, equipment, materials, and supplies shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

ARTICLE 43 - CODES AND STANDARDS

Wherever reference is given to codes, standard specifications or other data published by regulating agencies including, but not limited to, national electrical codes, North Carolina state building codes, federal specifications, ASTM specifications, various institute specifications, etc., it shall be understood that such reference is to the latest edition including addenda published prior to the date of the contract documents.

ARTICLE 44 - INDEMNIFICATION

To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance or failure of performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the contractor, the contractor's subcontractor, or the agents of either the contractor or the contractor's subcontractor. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this article.

ARTICLE 45 - TAXES

a. Federal excise taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3442(3)).

b. Federal transportation taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3475(b) as amended).

c. North Carolina sales tax and use tax, as required by law, do apply to materials entering into state work and such costs shall be included in the bid proposal and contract sum.

d. Local option sales and use taxes, as required by law, do apply to materials entering into state work as applicable and such costs shall be included in the bid proposal and contract sum.

e. **Accounting Procedures for Refund of County Sales & Use Tax**

Amount of county sales and use tax paid per contractor's statements:

Contractors performing contracts for state agencies shall give the state agency for whose project the property was purchased a signed statement containing the information listed in G.S. 105-164.14(e).

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement as of April 1, 1991 from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

In the event the contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of county sales or use tax paid thereon by the contractor.

Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.
Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES

The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)

The State of North Carolina has attempted to address all asbestos-containing materials that are to be disturbed in the project. However, there may be other asbestos-containing materials in the work areas that are not to be disturbed and do not create an exposure hazard.

Contractors are reminded of the requirements of instructions under Instructions to Bidders and General Conditions of the Contract, titled Examination of Conditions. Statute 130A, Article 19, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* from the State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

ARTICLE 49 - MINORITY BUSINESS PARTICIPATION

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix E are hereby incorporated into and made a part of this contract.

ARTICLE 50 – CONTRACTOR EVALUATION

The contractor's overall work performance on the project shall be fairly evaluated in accordance with the State Building Commission policy and procedures, for determining qualifications to bid on future State capital improvement projects. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, Contractor Evaluation Procedures, is hereby incorporated and made a part of this contract. The owner may request the contractor's comments to evaluate the designer.

ARTICLE 51 – GIFTS

Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any State employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32.

During the construction of the Project, the Contractor is prohibited from making gifts to any of the Owner's employees, Owner's project representatives (architect, engineers, construction manager and their employees), employees of the State Construction Office and/or any other State employee that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS

In accordance with N.C. General Statute 147-64.7, the State Auditor shall have access to Contractor's officers, employees, agents and/or other persons in control of and/or responsible for the Contractor's records that relate to this Contracts for purposes of conducting audits under the referenced statute. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or

relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT

The North Carolina False Claims Act ("NCFCA"), N.C Gen. Stat. § 1-605 through 1-618, applies to this Contract. The Contractor should familiarize itself with the entire NCFCA and should seek the assistance of an attorney if it has any questions regarding the NCFCA and its applicability to any requests, demands and/or claims for payment its submits to the State through the contracting state agency, institution, university or community college.

The purpose of the NCFCA "is to deter persons from knowingly causing or assisting in causing the State to pay claims that are false or fraudulent and to provide remedies in the form of treble damages and civil penalties when money is obtained from the State by reason of a false or fraudulent claim." (Section 1-605(b).) A contractor's liability under the NCFCA may arise from, but is not limited to: requests for payment, invoices, billing, claims for extra work, requests for change orders, requests for time extensions, claims for delay damages/extended general conditions costs, claims for loss productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, documentation used to support any of the foregoing requests or claims, and/or any other request for payment from the State through the contracting state agency, institution, university or community college. The parts of the NCFCA that are most likely to be enforced with respect to this type of contract are as follows:

- A "claim" is "[a]ny request or demand, whether under a contract or otherwise, for money or property and whether or not the State has title to the money or property that (i) is presented to an officer, employee, or agent of the State or (ii) is made to a contractor … if the money or property is to be spent or used on the State's behalf or to advance a State program or interest and if the State government: (a) provides or has provided any portion of the money or property that is requested or demanded; or (b) will reimburse such contractor … for any portion of the money or property which is requested or demanded." (Section 1-606(2).)

- "Knowing" and "knowingly." – Whenever a person, with respect to information, does any of the following: (a) Has actual knowledge of the information; (b) Acts in deliberate ignorance of the truth or falsity of the information; and/or (c) Acts in reckless disregard of the truth or falsity of the information. (Section 1-606(4).) Proof of specific intent to defraud is not required. (Section 1-606(4).)

- "Material" means having a natural tendency to influence, or be capable of influencing, the payment or receipt of money or property. (Section 1-606(4).)

- Liability. – "Any person who commits any of the following acts shall be liable to the State for three times the amount of damages that the State sustains because of the act of that person[:] … (1) Knowingly presents or causes to be presented a false or fraudulent claim for payment or approval. (2) Knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim. (3) Conspires to commit a violation of subdivision (1), (2) …" (Section 1-607(a)(1), (2).)

- The NCFCA shall be interpreted and construed so as to be consistent with the federal False Claims Act, 31 U.S.C. § 3729, et seq., and any subsequent amendments to that act. (Section 1-616(c).)

Finally, the contracting state agency, institution, university or community college may refer any suspected violation of the NCFCA by the Contractor to the Attorney General's Office for investigation. Under Section 1-608(a), the Attorney General is responsible for investigating any violation of NCFCA, and may bring a civil action against the Contractor under the NCFCA. The Attorney General's investigation and any civil action relating thereto are independent and not subject to any dispute resolution provision set forth in this Contract. (See Section 1-608(a).)

ARTICLE 54 – TERMINATION FOR CONVENIENCE

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

SUPPLEMENTARY GENERAL CONDITIONS

MODIFICATIONS TO THE GENERAL CONDITIONS (OC-15)

INTRODUCTION

This document modifies and augments the General Conditions and is published for the purpose of amending, revising, and clarifying the Contract Documents. It is hereby made an element of the Contract. This document takes precedence over the General Conditions.

ARTICLE I -DEFINITIONS

Paragraph "b": Add the following to the end of the paragraph: “The Owner is defined as The Trustees of Wake Technical Community College. Under the Delegation of Authority granted to Wake Technical Community College by the Community College System Office, throughout the contract documents, replace "the State Construction Office" or "SCO" with "the Owner".

Paragraph "cc": Add the following new paragraph: “Latest edition” shall mean the current printed version of the referenced document issued up to 30 calendar days prior to date of receipt of bids, unless specified otherwise.

Paragraph "dd": Add the following new paragraph: “Drawings” or "plans" shall mean the drawings enumerated in the contract documents, as well as all the information in the detail manual (when applicable), addenda, and designer-prepared field drawings and clarification drawings.

Paragraph "ee": Add the following new paragraph: “Specifications” mean this project manual and addenda thereto.

ARTICLE 2- INTENT AND EXECUTION OF THE DOCUMENTS

Paragraph "a": Add the following new sub-paragraphs:

1. “These drawings and specifications represent the general dimensional and aesthetic requirements for various "in place" materials required to produce parking lot improvements acceptable to the owner for his intended use.
2. It is the intent of these drawings and specifications to meet the requirements of the North Carolina State Building Code and any other applicable jurisdiction.
3. The Contractor shall make all reasonable efforts to achieve this intent. If any detail shown on these drawings appears inconsistent with this intent, in the opinion of the Contractor, he shall notify the Designer in writing of his opinion and await instructions from the Designer before proceeding with the work.
4. Where more detailed information is needed, or when an interpretation of the contract documents is required, the Contractor shall refer the matter in writing to the Designer prior to proceeding with the work. The Designer shall furnish the Contractor an interpretation in writing.
5. If the Contractor discovers errors, inconsistencies, discrepancies or omissions in the contract documents, the Contractor shall inform the Designer of such condition prior to proceeding with the work.
6. If the Contractor discovers errors, inconsistencies, discrepancies or omissions in the contract documents prior to bid, the Contractor shall request clarifications from the Designer and shall include in the bid price all work required to deliver a fully operational and ready to use system.
7. If inconsistencies, discrepancies or contradictions in the Contract Documents are discovered after the bid, the Contractor shall be deemed by submittal of his bid, to have bid the most costly as to labor, materials, duration, sequence and method of construction to provide the work.”
8. In all cases noted above, the Contractor shall copy to the owner on all correspondence.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLE DATA

Paragraph "c": Replace “retaining three (3) copies (1 for the Designer, 1 for the owner, and 1 for SCO)” with “retaining an electronic copy and two (2) hard copies of samples (1 for Designer and 1 for the Owner)” Add the following new paragraph: “The schedule must account for any resubmittals required to obtain approval from the Project Designer and Owner.”

Paragraph "d": Add the following new paragraph: “No time extension will be granted for delays caused due to failure of the Contractor to properly review shop drawings prior to submittal to the Project Designer. All shop drawings shall indicate how materials relate to conditions of the project. Standard manufacturer's drawings that do not show how and where material is to be used will not be reviewed by the Project Designer. Shop drawings shall not be reproductions of contract documents. Coordination drawings are required in accordance with **Article 14**.”

ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES

Paragraph "d": Add the following to the end of the paragraph: “Contractor is responsible for meeting all necessary testing as recommended by the manufacturer for all approved substitutions.”

Paragraph "e": Add the following to the end of the paragraph: “The Contractor shall obtain written approval from the Project Designer for the use of products, materials, or equipment claimed as equal to those listed in the specifications. The Contractor shall submit within thirty (30) calendar days following award of contract a complete list of materials to be used for the project for review and approval by the Project Designer. The list shall consist of materials, products and equipment as listed in the specifications, equals, or approved equals. When this list is approved by the Project Designer, no substitution will be permitted except in unusual or extenuating circumstances. If no list is submitted, the Contractor shall supply only materials, products, or equipment required by the specifications.”

Paragraph "g": Add the following to the end of the paragraph: “All construction personnel shall be respectful to all Wake Technical Community College staff and students. Any disrespect, harassment, unwelcome comments, or advances from any construction personnel toward any staff member or student shall constitute sufficient grounds for Wake Technical Community College to request removal of any specific individuals from this project. Such action taken by the Owner shall not constitute grounds for a delay claim. The Owner will not be responsible for any delays caused to the project due to any individual being removed from the project.”

ARTICLE 11- PROTECTION OF WORK, PROPERTY, AND THE PUBLIC

Paragraph "j": Add the following paragraph: “In case emergency contact is required, the Contractor shall furnish the Owner with names, pager numbers, and telephone numbers (day and night) of the project manager and superintendent. The numbers shall remain current for the duration of the project and shall be updated as changes occur.”

Paragraph "k": Add the following paragraph: “The Owner will provide security as it deems prudent and necessary for its own protection. The Contractor shall be responsible for security and safety of the project within the project limits, including on-site materials. The Contractor and the Owner shall meet on a regular basis as required, but not less than weekly to coordinate safety and security issues.”

Paragraph "l" Add the following paragraph: “The Owner will conduct normal operations during the duration of the project. Unless otherwise stated, the campus will be occupied and will operate on a normal schedule. This means that the Contractor will be required to schedule work around regular operations, special events, visitors, and staff requirements. The Contractor shall coordinate with the Owner's representative to minimize any disruptions to the functions of the College.”

ARTICLE 12- SEDIMENTATION POLLUTION CONTROL ACT OF I 973

Paragraph "e": Add the following new paragraph: “The Contractor shall comply with the following requirements: Equipment utilized during the construction activity on a site must be operated and maintained in a manner as to prevent the potential or actual pollution of the surface or ground waters. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged on the ground or into surface waters. Spent fluids shall be disposed of in an immediate manner so as not to enter the waters, surface, or ground, and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in an immediate manner so as not to allow their entry into the waters, surface or ground, storm sewers, or drains on private or public property. Herbicide, pesticide, and fertilizer usage during the construction activity shall be restricted to those Materials approved by EPA and shall be used in accordance with label instructions. All wastes composed of construction materials shall be disposed of in accordance with NC General Statutes, Chapter 130A, Article 9- Solid Waste Management, and rules governing the disposal of solid waste (NC Administrative
Code Section l5A NCAC 13B).”

Paragraph "f": Add the following new paragraph: “Minimum Monitoring and Reporting Requirements

1. All sedimentation and erosion control of facilities shall be inspected by the Contractor at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24hour period.
2. Storm water runoff discharges shall be inspected by visual observation for color, foam, outfall, staining, visible sheens, dry weather flows and muddy water (at the frequency described above) to evaluate the effectiveness of the pollution control facilities or practices. If any visible off-site sedimentation is leaving the site, corrective action shall be taken to reduce the discharge of sediments.
3. The Contractor shall submit to the Owner a written report of weekly inspections. Visible sedimentation found off the site shall be recorded with a brief explanation as to the measures taken to prevent future releases as well as any measures taken to clean up the sediment that has left the site. This record shall be made available to Department of Environmental Management or authorized agent upon request.

Paragraph "g": Add the following new paragraph: “Maintenance and Inspections

1. The Contractor shall keep all erosion controls devices and materials in good repair. The Owner reserves the right, within 24 hours prior notice to the Contractor to repair any erosion control measures or materials as required and deduct the cost of those repairs from the Contractor's application for payment.
2. The owner's representative may periodically evaluate the project for compliance with these requirements.”

ARTICLE 14 – CONSTRUCTION SUPERVISION AND SCHEDULE

Paragraph "g": Schedule shall be completed following Subparagraph 1.

Paragraph "j": Add the following to end of paragraph: “Contractor shall provide a two-week schedule look ahead during biweekly Owner-Architect-Contractor (OAC) meetings.”

Paragraph "g": Schedule shall be completed following Subparagraph 1.

Paragraph "m": Add the following new paragraph: “When construction takes place in an occupied building, Contractor is to submit a weekly schedule of activities for Owner coordination.”

ARTICLE 15 – SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

Paragraph "g": Add the following new paragraph: E-Verify Compliance: Pursuant to Session Law 2013-418, Contractor shall fully comply with the U.S. Department of Homeland Security employee legal status E-Verify requirements for itself and all its subcontractors. Owner requires an affidavit attesting to Contractor's compliance. Violation of the provision, unless timely cured, shall constitute a breach of contract.

ARTICLE 19 – CHANGES IN THE WORK

Paragraph "b" Paragraph 2 Line 1: Remove "transmitted by fax."

Paragraph "k": Add the following new paragraph: "Change orders will be approved via Interscope+ and the Contractor shall be registered with appropriate access to the system. Proposed Change Orders (PCO) shall have a unique numerical designation corresponding to an Interscope+ PCO number, if it is an approved change. All PCOs shall be assigned one of the following cause codes:

1. Owner Request (OR)
2. Contractor Request (CR)
3. Designer Request (DR)
4. Concealed Condition (CC)
5. Design Error (DE)
6. Design Omission (DO)
7. Schedule Change (SC)
8. Other (OT)"

ARTICLE 23 - TIME OF COMPLETION DELAYS, EXTENSION OF TIME

Paragraph "a": Add the following to the end of the paragraph: "The time of completion for the project is 558 consecutive calendar days as measured from the date stated in the Designer's Notice to Proceed issued to the Contractor.

Paragraph "b": Add the following to the end of the paragraph: "Liquidated damages are in the amount of $2,500.00 per calendar day."

Paragraph "d": Add the following as a third paragraph" "If the owner and the Contractor agree that the Contractor has been delayed by abnormal weather conditions not reasonably anticipated for the locality where the work is performed, a day-for-day time extension shall be the Contractor's only remedy and compensation for delay. Extended general conditions, profit, fees or any other additional compensation shall not be allowed."

Paragraph "h": Add the following new paragraph: "Working hours: The Contractor shall establish a working hour and date schedule and submit to the Owner's representative for approval. Any deviations from this schedule shall be requested from and approved by the Owner at least five (5) workdays in advance.

The Contractor shall agree to additional restrictions on working hours and days as may be enforced by the Owner during certain periods of the year such as, but not limited to, the week of final exams each semester.

ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY

Paragraph "b" Line 1: Replace "a building" with "the project area."

Paragraph "b-2": Replace "entire building" with "the affected portions of the project area."

Paragraph "c" Line 2: Replace "substantially complete" with "substantially complete and/or to have reached beneficial occupancy"

ARTICLE 31 – REQUEST FOR PAYMENT

Paragraph "c": Add the following sentence to the end of the paragraph "Contractor's General Conditions shall be prorated on a monthly basis to cover expenses that are expected to incur within the month, however, in no case shall the amount of General Conditions in any single month pay application exceed 15% of the total amount allocated for General Conditions over the life of the contact."

Paragraph "f": Add the following new paragraph: "Provide Wake Technical Community College Red Line Letter with request for payment to the Designer for review and approval."

ARTICLE 34 – MINIMUM INSURANCE REQUIREMENTS

Paragraph "g": Add the following new paragraph: "All additional requirements of the *Wake Technical Community College Minimum Insurance Requirements* document shall be met." The below insurance requirements are included for reference.

CONTRACT	COVERAGE	DURATION	MINIMUM LIMIT
Formal Contract (>$500K)	Auto 2, 3, 4, 5	Warranty	$1,000,000
	Builders Risk 1, 2, 3, 4, 5	Final Completion	Contract Amount
	General Liability 1, 2, 3, 4, 5	6 years	$2,000,000
	Pollution Liability 1, 2, 3, 4, 5	6 years	$2,000,000
	Professional Liability 2, 3, 4, 5	6 years	$2,000,000
	Umbrella 1, 2, 3, 4, 5,7	6 years	$3,000,000
	Cyber Liability 2, 3, 4, 5, 6	6 years	$2,000,000
	Workers Comp 2, 3, 4, 5	Final Completion	$1,000,000

1. The Trustees of Wake Technical Community College, required to be endorsed as additional insureds for General Liability and Builders Risk/Installation Floater.
2. Must be endorsed to provide 30 days prior notice of cancellation, registered mail, return receipt requested.
3. Must be endorsed for Waiver of Subrogation in favor of the Owner
4. Insurers must carry an AM Best rating of A+ or greater and registered to operate in the State of North Carolina.
5. The Trustees of Wake Technical Community College, 9101 Fayetteville Road, Raleigh, NC 27603 must be labeled as certificate holder
6. Cyber liability can be waived if no access to Wake Tech systems in required.
7. Based on original contract amount:
   Less than $1M – Coverage of $1M
   From $1M to $5M – Coverage of $2M
   From $5M to $10M – Coverage of $5M
   From $10M to $25M – Coverage of $10M
   From $25M and above – Coverage of $25M

ARTICLE 38 – USE OF PREMISES

Paragraph "e": Add the following new paragraph: "Storage of construction materials shall be limited to the staging area, as defined in the contract documents."

Paragraph "f": Add the following new paragraph: "Where equipment must cross walks, landscaping areas, or ramps, the Contractor shall provide ¾" plywood sheets for protection of these areas. Cross walks, landscaping areas, or ramps damaged by construction activity shall be repaired or replaced."

Paragraph "g": Add the following new paragraph: "The construction site and staging areas as well as Owner's adjacent campus areas shall be kept free of trash, litter, and debris at all times."

Paragraph "h": Add the following new paragraph: "Grass in the construction site shall be mowed as often as required to maintain a neat appearance. Tree protection shall extend at least to the dripline of the trees to be protected. Unless otherwise shown on the drawings, minimum tree protection shall include four-foot landscaping fencing supported with steel stakes four foot on center. All areas under the drip line of trees are off limits to vehicular traffic unless protected by plywood."

Paragraph "i": Add the following new paragraph: "Landscape protection when required, shall be installed prior to the initial grading stage. No storage of any kind, access, or activity of any kind will be permitted inside the landscaping protection areas."

Paragraph "j": Add the following new paragraph: "When required by the drawings, a construction fence shall be installed. The fence shall be construction of heavy-duty chain link material, have a minimum height of six feet and it shall have a continuous top tubular rail. Swing gates shall be included at all and every access to the enclosed area."

ARTICLE 39 – CUTTING, PATCHING AND DIGGING

Paragraph "a": Add to the end of Paragraph: "The Contractor shall be responsible for locating all underground utilities (including public and private) prior to excavation. The Contractor may obtain the services of a commercial utilities locator and/or various utility companies who may have lines inside the area. In addition, Contractors shall contact the Owner's Representative at least five (5) days prior to excavation. The Contractor will be responsible for utility interruptions caused by construction operations including excavations."

Paragraph "d": Add the following new paragraph: "All cutting, and patching required to perform the work, and to install the specified products under a particular contract shall be performed at contractor's expense. All patching work shall be made by craftsmen skilled in the required work on who may already be engaged on the project. All painting within previously painted areas shall be painted at the contractor's expense. All painting shall be by skilled painters who may already be engaged on the project."

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

Paragraph "c": Add the following to the end of the paragraph: "In the event of a single prime contract, General Contractor is responsible for reimbursement."

Paragraph "m": Add the following new paragraph: "It is imperative that Owner's utilities and other services be maintained at all times except for scheduled interruptions. Any necessary utility interruptions shall be approved by the Owner's Representative at least 7 days in advance. If necessary, work shall be performed at night, over the weekend, or during holidays. No extra payment will be made for such work. When utility services cannot be interrupted for the length of time required, the Contractor shall make provisions for temporary services."

Paragraph "n": Add the following new paragraph: "Pedestrian traffic around the construction limits must be maintained in a clean and safe condition at all times." Refer to **Article 11**.

ARTICLE 42 – GUARANTEE

Paragraph "e": Add the following new paragraph: “Contractor to schedule and conduct 11-month warranty walk-through with Designer of Record and Owner as part of warranty process.”

ADD ARTICLE 55 – EE PROGRAMS

Paragraph "a": Add the following new paragraph: “Wake Tech Community College shall capture all applicable EE Programs offered through utilities, vendors, manufacturers, government programs, etc. Consultant forfeits eligibility of claim to such EE Programs related to Wake Tech Community College Project(s) unless specifically granted these rights in writing by Wake Tech Community College and agrees to cooperate to support Wake Tech Community College’s participation of EE Programs. Wake Tech Community College may seek to allocate certain tax benefits pursuant to Section 179D of the Internal Revenue Code of 1986, as amended (the "Code') through its agreement with Consultant. If Wake Tech Community College and the Internal Revenue Service (IRS) determine that Consultant is eligible and shall receive the 179D deduction allocation as a "Designer" for the purposes of Section 179D of the Code or that Consultant shall otherwise benefit financially from the monetization of the benefit, Consultant hereby agrees to provide savings to Wake Tech Community College in an amount and form to be determined when the financial benefit net of associated costs realized by Consultant becomes ascertainable. Wake Tech Community College reserves the right to retain a third-party coordinator (the "Coordinator") to manage and administer the process of allocating the benefit derived from the Project(s). Consultant agrees to cooperate in all reasonable respects with the Coordinator's efforts to obtain and monetize any such benefits derived from the Project(s) on behalf of Wake Tech Community College.”

END OF SUPPLEMENTARY GENERAL CONDITIONS

Month Day, Year

Project Manager Name
Facilities Design & Construction
9101 Fayetteville Road
Montague Hall, Suite 208
Raleigh, NC 27603

RE: SCO ID # 21-23932-02A– Technology 4.0 Building

Dear Project Manager Name:

In accordance with the contract documents, we hereby certify that we have reviewed the redlines for the above referenced project and to the best of our knowledge, they are current through the work covered by the application for payment # XX.

Yours sincerely,

Name, Title
Construction Company

DESIGNER OF RECORD

As the designers of record, we have reviewed the above referenced documents and certify to the best of our knowledge that they appear to be complete and accurate for the referenced time period.

_____
Name – Designer

Area	Post Construction Cleaning Service Functions
Floors: Vinyl Tile & Linoleum	Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Build up under table/desk legs or movable furniture will not exist. Vinyl tile floors shall not have a patchy appearance or show signs of uneven stripping. Floors shall not be gritty, sticky, slippery or dusty.
Floors: Raised Floors	Raised floors shall possess a clean uniform appearance, without scuffs, black marks, spots or patchy areas. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Build up under table/desk legs or movable furniture will not exist. Floors shall not be gritty,
Floors: Rubber Based	Rubber based floors shall not be chalky or have buildup on textured surfaces. They shall be buffed to an even sheen. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Build up under table/desk legs or movable furniture will not exist. Floors shall not
Floors: Ceramic Tile	Ceramic tile floors shall not be sticky, slippery, chalky or dusty. Grout shall be free of residue, mildew, build up and removable stains. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Build up under table/desk legs or movable furniture will not exist. Floors shall not be gritty, sticky, slippery or dusty.
Floors: Carpet	Carpet shall be free of spots, stains, tar streaks, browning and debris including staples, paper clips, etc. Carpet pile shall not be matted or uneven. Corners, edges, under and around furniture and behind doors shall be free of dust and debris.
Floors: Baseboards	Baseboards shall be free of dirty build up, splash and residue.
Floors: Terrazzo Floors	Floors shall be cleaned in corners, edges, and along baseboards. They are to be clean and free of buildup and debris. Spots, gum, and stains shall be removed. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Build up under table/desk legs or movable furniture will not exist. Floors shall not be gritty, sticky, slippery or
Floors: Vinyl Tile & Terrazzo Final Prep	Floors shall be scrubbed and prepared with care as to limit imperfections/dust/dirt being present under floor finish. In classrooms/offices/break areas 4 coats of Diversey High Mileage floor finish should be applied evenly minimizing streaks. In hallways/common areas 5 coats of High Mileage should be applied evenly minimizing streaks. All finished floors should be high speed burnished after the curing process has

Area	Post Construction Cleaning Service Functions
Walls, Doors and Partitions: Walls	Walls shall be free of excessive dust, tape, spots, handprints, hand grease, smears and streaks.
Walls, Doors and Partitions: Doors	Doors, doorframes, jams and hinges shall be free of dust spots, smears, streaks, handprints, hand grease, tape and shall not be oily or sticky. Thresholds shall be clean and free of grit, wax build up, spots, etc.
Walls, Doors and Partitions: Partitions	Partition tops and sides shall be free of dust, spots, stains, etc. Bases shall not have build-up or splashes.
Ledges and Shelves:	Ledges and shelves shall be free of dust, debris, cobwebs and spots. They shall not be sticky or oily. Corners shall be clean.
Ledges and Shelves: Shelves	Shelves shall be dusted in accessible areas and be free of spots, etc.
Windows and Glass: Exterior Surface	Exterior surfaces of perimeter glass shall be free of drips, runs, spots, smudges, deposits, cobwebs and splash especially in the lobby/entrance
Windows and Glass: Interior Surfaces	Interior surfaces of perimeter glass shall be free of dust, drips, runs, spots, smudges, fingerprints, deposits, cobwebs and splash especially in the lobby/entrance ways.
Windows and Glass: Doors/Partitions	Doors and partition glass shall be free of fingerprints, splash, drips, cobwebs, runs, etc.
Ceilings: Vents/Diffusers:	Vents and diffusers shall be free of dust, soil and cobwebs.
Ceilings: Light Fixtures	Light fixtures and diffusers shall be free of dust, dirt, soil, bugs, etc.
Restrooms: Sinks	Sinks shall be free of dirt, grease, hair, etc. Faucets shall be free of spots and build-up, especially around the base of the faucet. Drains shall not be clogged or have build-up where drain meets porcelain. Piping under the sink shall also be clean and free of dust. Walls around and under sinks shall not have drip or soap residue.
Restrooms: Toilets/Urinals	Toilets/urinals shall be free of streaks and stains. There shall be no encrustation under rims or hard water rings in bowl. Rim, seat and exterior shall be free of water spots, hair and dirt. Fixtures shall be without spots, streaks or build up where porcelain meets fixture. No dirt or build up shall exist where base of toilet meets floor.
Restrooms: Partitions	Tops shall be free of dust and debris. Sides shall be free of dust, drips, splash, soil and graffiti and shall not be oily or sticky. Stanchions shall be polished, but not oily.
Restrooms: Dispensers and Waste Containers	Dispensers and waste containers shall be clean inside and out. They shall be free of grease, drips, streaks and soap residue. Stainless steel shall be uniformly polished but not oily.
Restrooms: Mirrors	Mirrors shall be free of dust, spots, and streaks and hazing. They shall be cleaned from top to bottom and side to side.
Restrooms: Walls	Walls shall be free of spots, dust, streaks, etc. Grout shall be clean and free of residue and build-up, especially near dispensers, sinks and urinals.
Restrooms: Floors	Floor grout restrooms shall be clean and free of build-up or stain. Floors shall be cleaned in corners, edges, and along baseboards. They are to be clean and free of buildup and debris. Spots, gum, and stains shall be removed. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Mounted fixtures, equipment, stanchions and support beams shall be clean at base without wax or dirt build up. Floors shall not be gritty, sticky,

Area	Post Construction Cleaning Service Functions
Restrooms: Showers	Shower walls, floors, baseboard, soap dishes and fixtures shall be clean and free of mildew, soap scum, soil, streaks, graffiti, etc.
Restrooms: Vents/Lights	All vents and light fixtures shall be free of dust, mildew, dirt, and soap film.
Restrooms: Lockers	Tops, exteriors and interiors of unoccupied lockers shall be free of dust, spots, debris, mildew, etc.
Restrooms: Counters	Tops and fronts of counters shall be free of spots, watermarks, grease, soap residue, etc.
Elevator: Walls	Elevator walls shall be free of spots, dust, handprints, tape, graffiti, stains etc. Polished walls shall be uniformly clean, but not oily. Fabric covered walls shall be free of dust, lint, etc.
Elevator: Doors	Elevator doors shall be clean, polished and free of handprints, streaks, spots, dust, etc. Rubber bumper guards shall be free of grease, spots, etc. Trim and kick plates shall be free of dirt and wax build-up, etc. Stainless steel shall be uniformly polished.
Elevator: Tracks	Cab tracks and thresholds on each floor shall be free of sand, grit, debris, build up, etc.
Elevator: Ceilings	Ceilings and light fixtures shall be clean and free of bugs, debris, cobwebs, dust, etc.
Elevator: Floors	Floors shall be cleaned in corners, edges, and along baseboards. They are to be clean and free of buildup and debris. Spots, gum, and stains shall be removed. Corners and edges are to be clean and free of debris and build up. Gum, tar and spots will be removed. Baseboards, kick plates, thresholds and lower walls are to be free of any build up or splash. Floors shall not be gritty, sticky, slippery or dusty.
Wooden Sports Floor: Recommendations	Remove any black marks or heel marks with soft cloth using an approved floor cleaner, such as Bona Sport, Pacific Clean. Follow Maple Floor Manufactures Association (MFMA) recommendations in carrying for the MFMA Maple Floor cleaning. Use MFMA recommendations specifically designed for compatibility with the finish used on maple floors.

List Name	Product Number	Description
WTCC Chemicals	316767718	Diversey Crew 32oz Tile and Grout Cleaner (12 pack)
WTCC Chemicals	CGP14278	AJAX 21 oz. Oxygen Bleach Powder Cleanser
WTCC Chemicals	JWP04134	SnapBack 1 Gal. Floor Restorer
WTCC Chemicals	JWP3063437	Crew RTD 52.7 oz. Restroom Floor and Surface Non-Acidic Disinfectant/Cleane
WTCC Chemicals	JWP3350727	DIVERSEY INC Rtd Alpha-Hp 1.5 l Multi-Surface Cleaner
WTCC Chemicals	JWP5104731	Carefree 5 Gal. Floor Finish
WTCC Chemicals	JWP5161727	Wood Care F5 DIVERSEY INC 1 Gal.
WTCC Chemicals	JWP903909	STRIDE Accumix 1 Qt. Citrus All-Purpose Cleaner (6-Case)
WTCC Chemicals	JWP904116	SnapBack 1 Gal. Multi-Surface Buff Spray (4-Case)
WTCC Chemicals	JWP904192	32 oz. General Purpose Spotter - 6 PER CASE
WTCC Chemicals	JWP904271	Diversey Accumix Stench and Stain Digester 1 Qt. Carpet Cleaner (6-Case)
WTCC Chemicals	JWP93063390	STRIDE 5 Liter RTD Citrus Neutral Cleaner
WTCC Chemicals	JWP93063402	DIVERSEY INC Rtd Glance 1.5 l Glass and Surface Cleaner (2-per Case)
WTCC Chemicals	JWP93145310	DIVERSEY INC Rtd Crew 44 1.5 l Bathroom Cleaner and Scale Remover (2-per
WTCC Chemicals	JWP95002700	DIVERSEY INC 1 Gal. Bonnet Buff
WTCC Chemicals	JWP95032360	Diversey Pro Strip 5 Gal. Heavy-Duty Floor Stripper
WTCC Chemicals	JWP95104811	High Mileage 5 Gal. Floor Finish
WTCC Chemicals	JWP95628817	6.5 oz. Gum Remover (12-Case)
WTCC Chemicals	JWP95765571	SHINE-UP 19 oz. Lemon Furniture Polish (12 per Case)
WTCC Chemicals	SPA3297-04	Spartan Chemical Consume Eco-Lyzer 1 Gallon Floral Scent Disinfectant/Deodo
WTCC Chemicals	SPA7320-12	SPARTAN CHEMICAL COMPANY SparCreme 1 Quart Lime Scent Restroom C

SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.01 WORK BY OWNER

A. Items noted NIC (Not In Contract) will be supplied and installed by Owner before Final Acceptance.

B. Items noted OFCI (Owner Furnished, Contractor Installed) will be supplied by Owner and installed by Contractor.

1.02 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Final Acceptance.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.03 CONTRACTOR USE OF SITE

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site to allow:
   1. Work by Owner or by others.

C. Provide access to and from site as required by law and by Owner.

D. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.04 SPECIFICATION AND DRAWING CONVENTIONS

A. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

B. Where the term "Engineer of Record (EOR)" or "Designer of Record" is used in the technical specifications it shall mean the Project Designer as defined in the General Conditions of the Contract.

1.05 MISCELLANEOUS PROVISIONS

A. Communications: Unless specifically directed otherwise in writing, all communication between the Architect's consultants and the Contractor shall be through the Architect. Only communications transmitted through the Architect will be deemed as project communications, upon which the Contractor may rely.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of proposed changes in Contract Price and Contract Time.

C. Contract Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Submit prior to the first Application for Payment, and within 30 calendar days of the Notice to Proceed, a printed schedule that accurately reflects the fair market value of the several portions of the work in a form acceptable to the Architect.

B. Submit a printed schedule showing each item of work and using the Table of Contents of this Project Manual as a guide. Identify each line item with number and title of the specification Section, breaking down individual sections into discrete items of work to facilitate evaluation of completion.

C. Show a breakdown of the Contract Price into values of the various parts of the Work, so arranged as to facilitate payments to subcontractors in accordance with Article 17 of the General Conditions of the Contract. List the value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

D. Include the amount of each unit price Allowance provided in the Contract Documents.

E. For unit price work, identify quantities taken from the Contract Documents multiplied by the Contract unit price to achieve the total for the item.

F. For all other items of work, list as separate lines:
   1. Cost of each primary material or significant piece of equipment including shipping to the site including associated overhead and profit.
   2. Cost of labor including payroll taxes, insurance, and benefits and associated overhead and profit.

G. Each item in the Schedule of Values and Applications for Payment shall be complete. Temporary facilities, mobilization, general conditions, and other major cost items that are not direct costs of actual work-in-place may not be shown as a separate line item.

H. List as separate lines:
   1. General Conditions.
   2. Bonds & Insurance.

I. Revise schedule to list approved Change Orders, with each Application For Payment. Multiple line items should be used if the Change Order includes several unrelated changes. No changes may be made to any line item value already approved in the Schedule of Values.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Calendar month.

B. Present required information on electronic media printout.

C. Form: AIA G702 Application and Certificate for Payment plus either AIA G703 Continuation Sheet or Contractor's electronic media driven form as continuation sheet.

D. Contractor shall provide an advance copy of application to the Designer not less than seven (7) days before submission of Application for Payment.
   1. Advance copy shall be in the form of previous month’s Application for Payment, marked with revised percentages proposed for the upcoming Application.
   2. Coordinate date of advance copy with last scheduled Architect’s site visit. Work completed or stored after that date shall be included in subsequent Application for Payment.

3. Proposed payment percentages shall be verified as complete by Contractor prior to submission and may not include projections of work not yet completed.

E. Execute certification by signature of authorized officer.

F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work. Where a single Change Order includes multiple Change Order Proposals, list each COP as a separate line item, with the total matching the total Change Order.

G. Submit pdf format electronic copies of each Application for Payment.

H. Completion of Individual Line Items: The final 10% of Work on all items shall be assumed to be for Quality Assurance/Quality Control (QA/QC) and correction of work. In the case of equipment, materials and installation may not be accepted until such time as they can be safely started and operated so that Designer's consultant can verify they are functional and operational. No line item may be paid beyond 90% until it has been substantially accepted by Designer. This is separate and apart from required retainage and will be authorized for payment as soon as the work of that line has been determined to be complete by the Designer, regardless of the status of any other work.

I. Payment for Stored Materials
   1. Payment for stored materials is limited to 90% of the total value of material line item in the schedule of values. Payment will be made only for materials that have been customized or fabricated specifically for this project.
   2. If payment for items stored off-site is agreed to by the Owner, provide documentation required by Article 31 of the General Conditions of the Contract.
   3. Provide written notice to Designer at least one week in advance of submission of draft application for payment that payment will be requested for stored materials to allow for inspection by Designer. Notification shall include a description of the materials, location where they are stored, and a copy of the delivery invoice indicating quantity of material in storage.
   4. Provide invoices or bills of sale or other evidence to establish the owner's title to all stored materials and equipment with Application for Payment.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question.

K. Attach updated CPM schedule to each Application for Payment as required by the General Conditions of the Contract. No Application for Payment will be processed until the project CPM schedule is approved by the Owner.

L. Include the following documents with each Application for Payment:
   1. Appendix E MBE Documentation for Contract Payments.
   2. County Sales and Use Tax Report form.
   3. Wake Technical Community College Red Line Letter.

1.04 MODIFICATION PROCEDURES

A. Architect will advise of minor changes in the Work not involving an adjustment to Contract Price or Contract Time as authorized by the Conditions of the Contract.

B. Field Order: Architect may issue a document, signed by the Architect, Owner, Contractor, and State Construction Office instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. The document will describe changes in the Work, and will designate a not-to-exceed value for any change in Contract Price or Contract Time.
   2. Architect will issue an associated Proposal Request for work following the process indicated in Article 19 of the General Conditions of the Contract. Approval of Field Order does not authorize work to proceed on a time and materials basis.
   3. Promptly execute the change in Work.

C. Proposal Request: Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications . Contractor shall prepare and submit a fixed price quotation within ten business days.
   1. The number assigned to the Proposed Change Order (PCO) must match the number assigned to the Proposal Request (PR). The Designer will have the sole responsibility for assigning numbers to changes in the work.
   2. It is the Contractor's responsibility to notify the Designer in writing if a Field Order is required not to delay the work.
   3. Pricing may not be withdrawn or increased because of Contractor's failure to provide timely response to Designer's request for additional information or revision.

D. Contractor may make a written claim for extra cost as indicated in Article 20 of the General Conditions of the Contract within seven (7) days of receiving instruction from the Designer. As appropriate, the Designer may issue a Proposal Request. No proposals will be considered prior to issuance of a Proposal Request except where it is necessary to provide informal pricing to expedite a Field Order.

E. Contractor may make a written claim for delay within twenty (20) days following cause of delay where allowed by Article 23 of the General Conditions of the Contract.

F. Computation of Change in Contract Amount:
   1. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
   2. For other changes, as indicated in Article 19 of the General Conditions of the Contract.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the General Conditions of the Contract on State Construction Office InterScope.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project As-Built Documents.

1.05 SUBSTANTIATION OF COST OF PROPOSED CONTRACT MODIFICATIONS

A. Contractor recognizes that changes are a necessary and essential part of the Work and may not constitute additional effort except as indicated in this Article.

B. Provide full information required for evaluation:
   1. Quantities of materials and the unit cost thereof including shipping to the site.
   2. Manhours of labor and hourly cost for each skill or labor classification.
   3. Labor burden including payroll taxes, insurance, and benefits.
   4. Quantities and costs of rental of equipment, tools, and other material not incorporated into the work.
   5. Costs for premiums of bonds, insurance, permit fees, or taxes related to the project.
   6. Credit for deletions from Contract, similarly documented.
   7. Overhead and profit to the extent allowed by Article 19 of the General Conditions of the Contract, applied to the "net cost" as defined in Article 19.
   8. Justification for any change in Contract Time.
   9. Other information requested by the Architect or required by Article 19 of the General Conditions of the Contract.

C. Time extensions for Change Order work will be granted only after the total float for any activity under which the Change Order work is accomplished is used up.

D. Delays shall be clearly defined with relation to each individual change. Cumulative effect of changes will not be considered.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.
   2. All requirements indicated in Article 32 of the General Conditions of the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner's independent testing agency.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Measurement by Area: Measured by square dimension using mean length and width or radius.

F. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

G. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.06 SCHEDULE OF UNIT PRICES

A. A1 Moisture-Resistant Sealer-Surfacer.
   1. Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.
   2. Measurement: Plan quantity, work in place.
   3. Payment: Per square foot.
   4. Include the following quantity in the Base Bid: 0 SF.

B. A2 Standard Flooring Adhesive for Resilient Flooring.
   1. Section 09 65 00 - Resilient Flooring.
   2. Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.

3. Measurement: Plan quantity, work in place.
4. Payment: Per square foot.
5. Include the following quantity in the Base Bid: 100% of the area to receive resilient flooring.

C. A3 Moisture-Resistant Flooring Adhesive for Resilient Flooring.
1. Section 09 65 00 - Resilient Flooring.
2. Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.
3. Measurement: Plan quantity, work in place.
4. Payment: Per square foot.
5. Include the following quantity in the Base Bid: 0 SF.

D. A4 Standard Flooring Adhesive for Carpet.
1. Section 09 68 13 - Tile Carpeting.
2. Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.
3. Measurement: Plan quantity, work in place.
4. Payment: Per square foot.
5. Include the following quantity in the Base Bid: 100% of the area to receive carpet.

E. A5 Moisture-Resistant Flooring Adhesive for Carpet.
1. Section 09 68 13 - Tile Carpeting.
2. Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.
3. Measurement: Plan quantity, work in place.
4. Payment: Per square foot.
5. Include the following quantity in the Base Bid: 0 SF.

F. C1 Removal of Rock from Trench Excavations
1. Section 31 23 17 - Trenching.
2. Description: Removal of trench rock, as approved by Owner’s Testing Agency, and offsite disposal.
3. Measurement: Volume, work in place.
4. Payment: Per bank cubic yard.
5. Include the following quantity in the Base Bid: 50 bank cubic yards.

G. C2 Undercut and Replacement of Unsuitable Soils with Off-site Structural Fill
1. Section 31 20 00 - Earth Moving.
2. Description: Offsite disposal of unsatisfactory materials (greater than 6” below current ground surface elevation), including trash, that cannot be used as structural fill, as approved by Owner’s Testing Agency. On-site borrow materials with moisture contents more than 10 percent wet of the soil’s optimum moisture content at time of excavation may be considered unsatisfactory. Haul-in of satisfactory materials from off-site borrow source for use as structural fill.
3. Measurement: Volume, work in place.
4. Payment: Per loose cubic yard.
5. Include the following quantity in the Base Bid: 100 loose cubic yards.

H. C3 Undercut and Replacement with 57 Stone
1. Section 31 20 00 - Earth Moving.
2. Description: Excavation below design subgrade of unstable subgrade materials and haul off and disposal and replacement with satisfactory washed #57 stone delivered to the site, placed, and compacted.
3. Measurement: Volume, work in place.
4. Payment: Per bank cubic yard.
5. Include the following quantity in the Base Bid: 500 bank cubic yards.

I. C4 Undercut and Replacement with ABC Stone
1. Section 31 20 00 - Earth Moving.

2. Description: Excavation below design subgrade of unstable subgrade materials and haul off and disposal and replacement with satisfactory, compacted ABC stone delivered to the site, placed, and compacted.
3. Measurement: Volume, work in place.
4. Payment: Per bank cubic yard.
5. Include the following quantity in the Base Bid: 200 bank cubic yards.

J. C5 Repair of Unstable Subgrade Soils
1. Section 31 20 00 - Earth Moving.
2. Description: In-place repair of unstable subgrade soils, that cannot be repaired by mechanical drying, using chemical additives (i.e. lime or cement amendment), as approved by Owner's Testing Agency.
3. Measurement: Area, work in place.
4. Payment: Per square yard.
5. Include the following quantity in the Base Bid: 600 square yards.

K. C6 Removal of Mass/Bulk Rock
1. Section 31 20 00 - Earth Moving.
2. Description: Removal of mass/bulk rock, as approved by Owner's Testing Agency, and offsite disposal.
3. Measurement: Volume, work in place.
4. Payment: Per bank cubic yard.
5. Include the following quantity in the Base Bid: 100 bank cubic yards.

L. C7 Haul-in of Off-Site Structural Fill
1. Section 31 23 17 - Trenching.
2. Description: Haul-in of satisfactory materials from off-site borrow source for use as structural fill.
3. Measurement: Volume, work in place.
4. Payment: Per loose cubic yard.
5. Include the following quantity in the Base Bid: 100 loose cubic yards.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00 - ALTERNATES

PART 1 GENERAL

1.01 ACCEPTANCE OF ALTERNATES

A. Alternatives quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each alternative.

1.02 SCOPE ALTERNATES

A. Alternate S1 - Carbon Dioxide (CO2) Mineralized Concrete:
   1. Base Bid Scope: Standard concrete mixes as specified in Section 03 30 00.
   2. Alternate Scope: CO2 mineralized concrete as specified in Section 03 30 00.

B. Alternate A1 - Roofing Membrane:
   1. Base Bid Scope: Provide TPO membrane roofing as specified in Section 07 50 00.
   2. Alternate Scope: Provide PVC membrane roofing as specified in Section 07 50 00 in lieu of TPO membrane.

C. Alternate A2 - Marker/Glass Boards:
   1. Base Bid Scope: Provide marker boards as specified in Section 10 11 01 at locations and sizes indicated on Drawings.
   2. Alternate Scope: Provide glass boards as specified in Section 10 11 01 in lieu of marker boards at locations and sizes indicated for marker boards.

D. Alternate A3 - Architectural Graphic Film:
   1. Base Bid Scope: No architectural graphic film as specified in Section 08 87 00.
   2. Alternate Scope: Provvide architectural graphic film as specified in Section 08 87 00 at locations indicated on Drawings.

E. Alternate A4 - Painted Piping in Mechanical Room 140A:
   1. Base Bid Scope: Exposed piping in Mechanical Room 140A and Mechanical Penthouse 401 to remain unpainted.
   2. Alternate Scope: Paint exposed piping in Mechanical Room 140A and Mechanical Penthouse 401 as specified in Section 09 91 00.

F. Alternate A5 - Ceramic Frit Glass:
   1. Base Bid Scope: Provide patterned glazing film on exterior glazing as specified in Section 08 80 00.
   2. Alternate Scope: Provide patterned ceramic frit on exterior glazing as specified in Section 08 80 00.

G. Alternate A6 - Custom Metal Wall Panels:
   1. Base Bid Scope: Metal laminate wall panels as specified in Section 06 42 00 at locations indicated in Drawings.
   2. Alternate Scope: Blackened steel metal wall panels as specified in Section 05 70 00 in lieu of metal laminate wall panels at locations indicated in Drawings.

H. Alternate M1 - HW/CW Redundant Pumps:
   1. Base Bid Scope: Provide valve end caps on isolation valves to future pumps CHWP-2 and HWP-2 as indicated on Drawings.
   2. Alternate Scope: Provide and install redundant Chilled Water Pump CHWP-2 and redundant Heating Hot Water Pump HWP-2 along with associated piping, insulation, valves, variable speed drives, and controls as indicated on Drawings.

I. Alternate M2 - Bipolar Ionization System:
   1. Base Bid Scope: Provide all air handling units as specified in Section 23 73 13 - Modular Air-Handling Units without bipolar ionization.

2. Alternate Scope: Provide air handling units as specified in Section 23 73 13 - Modular Air-Handling Units with bipolar ionization and associated controls as specified in Section 23 43 00 - Electronic Air Cleaners, at locations indicated in Drawings.

J. Alternate M3 - Master Systems Integration:
1. Base Bid Scope: The scope of work indicated in Section 25 15 10 - Master Systems Integration will be provided under separate contract. Coordinate with MSI contractor as required to support the EMIS scope as indicated in Article 15 of the General Conditions of the Contract.
2. Alternate Scope: Provide master systems integration as specified in Section 23 15 10 - Master Systems Integration.

K. Alternate E1 - Photovoltaic Power Generating System:
1. Base Bid Scope: Provide conduit, junction boxes, and other infrastructure for photovoltaic power generating system as indicated on Drawings.
2. Alternate Scope: Provide complete photovoltaic power generating system as indicated in Section 26 31 00 and E900 series drawings.

L. Alternate AV1 - Secondary Displays in Control Room 341:
1. Base Bid Scope: Provide base projection screen system (projector and projection screen) in Control Room 341 as indicated in Drawings.
2. Alternate Scope: Provide two (2) ceiling mounted 55” flat panel displays in Control Room 341 in addition to base bid projection system as indicated in Drawings.

1.03 OWNER PREFERRED-BRAND ALTERNATES

A. List price on bid form to provide preferred-brand products indicated below in lieu of full range of acceptable products indicated in individual Sections.

B. Alternate PB-1 - Owner-Preferred Door Hardware
1. Base Bid: Provide door hardware as indicated in Section 08 71 00 - Door Hardware.
2. Alternate: Provide Owner preferred-brand hardware as indicated below with balance of hardware as indicated in Section 08 71 00 - Door Hardware.
   a. Panic Hardware — Von Duprin Mod 99 series
   b. Locksets — Schlage L9000 Series Mortise 626 Finish
   c. Cylinder Shell — Schlage CYL. 30-016 626.L583-255
      1) Everest Large Format IC.
   d. Closer — LCN 4040XP series
   e. Hinges — Stanley or Ives Commercial Ball Bearing type
   f. Lever set — 626 finish
   g. Removable Mullions — Von Duprin

C. Alternate PB-2 - Owner-Preferred Exterior Trash Receptacle
1. Base Bid: Provide products as indicated in Section 32 33 00.
2. Alternate: Provide Victor Stanley Brand Model # S-42 power coated with rain bonnet lid (no ashtrays).

D. Alternate PB-3 - Owner-Preferred Clocks
1. Base Bid: Provide products as indicated in Section 27 53 13.
2. Alternate: Provide products manufactured by PRIMEX as indicated in Section 27 53 13.

E. Alternate PB-4 - Owner-Preferred BAS Controls Systems
1. Base Bid: Provide control systems as indicated in Section 23 09 00.
2. Alternate: Provide control systems from Distech Controls or Facility Explorer (JCI) as indicated in Section 23 09 00.

F. Alternate PB-5 - Owner-Preferred UPS
1. Base Bid: Provide products as indicated in Section 26 33 53.
2. Alternate: Provide products manufactured by Eaton/Powerware as indicated in Section 26 33 53.

G. Alternate PB-6 - Owner-Preferred ATS

1. Base Bid: Provide automatic transfer switches as indicated in Section 26 36 00.
2. Alternate: Provide ASCO 4000 series automatic transfer switches as indicated in Section 23 36 00.

H. Alternate PB-7 - Owner-Preferred Access Door Controllers & Modules
1. Base Bid: Provide products as indicated in Section 28 13 00.
2. Alternate: Provide products manufactured by iStar as indicated in Section 28 13 00.

I. Alternate PB-8 - Owner-Preferred Wall-mounted and Mullion-mounted Card Readers
1. Base Bid: Provide products as indicated in Section 28 13 00.
2. Alternate: Provide Basis of Design products by Schlage as indicated in Section 28 13 00.

J. Alternate No. PB-9 - Owner-Preferred Brick.
1. Base Bid: Provide clay brick or calcium silicate products as indicated in Section 04 20 00.
2. Alternate: Provide Basis of Design products manufactured by Arriscraft as indicated in Section 04 20 00.

K. Alternate No. PB-10 - Owner-Preferred Acoustical Ceiling System.
1. Base Bid: Provide products as indicated in Section 09 51 00.
2. Alternate: Provide products manufactured by Armstrong World Industries as indicated in Section 09 51 00.

L. Alternate No. PB-11 - Owner-Preferred Hot Fluid-Applied Rubberized Asphalt Roofing Assembly.
1. Base Bid: Provide products as indicated in Section 07 55 56.
2. Alternate: Provide products manufactured by American Hydrotech, Inc. as indicated in Section 07 55 56.

M. Alternate No. PB-12 - Owner-Preferred Wall Tile.
1. Base Bid: Provide products as indicated in Section 09 30 00.
2. Alternate: Provide T3 Wall Tile basis of design product manufactured by Best Tile as indicated in Section 09 30 00.

N. Alternate No. PB-13 - Owner-Preferred Resilient Tile Flooring.
1. Base Bid: Provide products as indicated in Section 09 65 00.
2. Alternate: Provide LVT1, LVT2, and LVT3 basis of design products manufactured by Mannington Commercial as indicated in Section 09 65 00.

O. Alternate No. PB-14 - Owner-Preferred Tile Carpet.
1. Base Bid: Provide products as indicated in Section 09 68 13.
2. Alternate: Provide Tile Carpeting Type 1 and Tile Carpeting Type 2 basis of design products manufactured by Tarkett Commercial as indicated in Section 09 68 13.

P. Alternate No. PB-15 - Owner-Preferred Metal Laminate.
1. Base Bid: Provide products as indicated in Section 06 42 00.
2. Alternate: Provide metal laminate basis of design product manufactured by MoZ as indicated in Section 06 42 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00 - ADMINSTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Weekly progress meetings.

C. Monthly meetings.

D. Progress photographs.

E. Coordination drawings.

1.02 SUBMITTALS

A. List of proposed subcontractors.

1.03 ELECTRONIC DELIVERY OF PROJECT CORRESPONDENCE

A. Unless otherwise required or permitted, deliver project correspondence and documentation to the Architect in electronic form via "Newforma Info Exchange" provided by the Architect at no cost to the Contractor.

B. Unless otherwise required or permitted, employ pdf format and create pdf documents using standard text/graphic conversion software such as Adobe or Bluebeam and employ bookmarks throughout the document for ease of navigation; manually scanned documents are not acceptable. Highlighting and added comments shall be made using pdf markup tools.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 LIST OF PROPOSED SUBCONTRACTORS AND SUPPLIERS

A. Submit list of names and addresses of subcontractors and equipment and material suppliers proposed to be used, together with the scope of their respective parts of the work, within 30 days after award of Contract.

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.
   5. Major Subcontractors.
   6. State Construction Office Project Monitor.

C. Agenda:
   1. Construction Schedule
   2. Schedule of values.
   3. Expected number of weather days.
   4. Liquidated damages.
   5. General and Supplementary General Conditions.
   6. Progress meetings (monthly meetings).
   7. Changed conditions (Change Orders).
   8. Requests for payment.
   9. Final pay request.
   10. Decorum on the construction site.
   11. Restroom facilities.

12. Parking.
13. Project working schedule.
14. Special requirements of the owner.
15. Final inspection of projects.
16. Record (As-Built) Drawings.
17. Safety Regulations.
18. Minority Business Contractors.
19. State Construction Office Requirements.
20. Inspection responsibilities and utility tap fees.
21. Temporary power, telephone and construction water.
22. County sales and use tax report forms.

D. Architect will record minutes and distribute copies to Contractor and Owner.

3.03 WEEKLY PROGRESS MEETINGS

A. Progress meetings will be held at weekly intervals.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings and resolve any corrections.
2. Work performed in last 7 days.
3. Work to be performed in next 7 days.
4. Two-week "look-ahead" schedule.
5. Requests for Proposal.
6. Review pending Change Orders.
7. Review Requests for Information (RFI) log.
8. Review submittals schedule and status of submittals.
9. Review construction progress schedule compliance.
   a. Provide a two-week look ahead schedule.
10. Discuss construction/coordination issues..
11. Designer Weekly Inspection Reports - Non-Conforming Work.
12. Special Inspections reports - Deficiency Notices.
13. Comments from Owner, Contractor, and Designers.
14. Next Meeting Date.

E. Architect will record minutes and distribute copies to Contractor and Owner.

3.04 MONTHLY PROGRESS MEETINGS

A. Architect will make arrangements for meetings, prepare agenda with copies for participants, and reside at meetings.

B. Attendance Required: Job superintendent, Principal Trade and Specialty Subcontractors, Owner, Architect, Architect's consultants, and State Construction Monitor.

C. Agenda:
1. Review minutes of previous meetings and resolve any corrections.
2. Work performed in last 30 days.
3. Work to be performed in next 30 days.
4. Two-week "look-ahead" schedule.
5. Requests for Proposal.
6. Review pending Change Orders.
7. Review Requests for Information (RFI).
8. Review submittals schedule and status of submittals.
9. Review construction progress schedule compliance.
10. Percentages complete - actual work complete.

11. Discuss construction/coordination issues..
12. Designer Weekly Inspection Reports - Non-Conforming Work.
13. Special Inspections reports - Deficiency Notices.
14. Comments from Owner, State Construction Office, Contractor, and Designers.
15. Next meeting date.

D. Architect will prepare and distribute minutes of monthly meetings.

3.05 PROGRESS REPORTS

A. Maintain a detailed daily diary of all events, which occur at the jobsite or elsewhere, and which affect, or may be expected to affect, project progress. The diary shall be available to the Owner and Designer at all times and shall be turned over to the Owner upon completion of the contract.

B. Distribute a copy of daily reports to the Designer and Owner at each monthly meeting.

3.06 COORDINATION DRAWINGS

A. Provide coordination drawings as required by Article 14 of the General Conditions of the Contract.

B. Prepare coordination drawings at 1/4" scale and submit to Designer for review within 90 days of Notice to Proceed and prior to installation of any affected work. Intent of Designer's review is to verify that work has been completed and shall not denote responsibility for content of Coordination Drawings on the part of the Designer.

C. Coordination Drawings are to be based on the Contract Documents only. Any proposed deviations to routing, sizes, attachment, or materials shall be submitted as a separate request prior to submission of Coordination Drawings.
1. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, electrical, fire protection, fire alarm, and security systems including work below slab, in floors, in walls, in shafts, in ceilings, above ceilings, on roofs and in other areas where the indicated disciplines relate.
2. Identify and provide operational and manufacturer recommended access for equipment, valves, panels, and other components that require access for operation, maintenance or repair.
3. Include all related disciplines on same drawings to clearly show coordination of trades. Additional drawings showing single trade may be used to supplement or clarify drawings with all trades.
4. For work on and above roof, comply with dimensional requirements indicated in Section 07 72 10.

D. Notify Designer of any conflict discovered in the preparation and review of Coordination Drawings. Obtain Designer's approval of proposed resolution to conflict prior to proceeding with work. Submit a separate RFI for each issue which requires a change in the Contract Documents. Notify Designer of any costs associated with design revisions due to conflict.

E. No change in the Contract Price or Time will be allowed for removal of Work in conflict which was not discovered during the Coordination Drawing process.

F. Submittals indicated in Section 09 05 10 are in addition to these coordination drawings and have additional requirements.

3.07 REQUESTS FOR INFORMATION (RFI)

A. When additional information concerning the Contract Documents is desired, the Contractor shall make a request to the Architect in the form of an RFI and shall include a detailed written statement that indicates the specific Drawing number or Specification paragraph number in need of clarification and the nature of the clarification requested.

B. The Architect will review and respond to requests for information about the Contract Documents. Allow five business days for Architect's response for each RFI. RFIs received by Designer after 1:00 p.m. will be considered as received the following business day. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information as indicated in Article 3 of the General Conditions of the Contract.

C. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of requested information.

3.08 CORRESPONDENCE

A. Designer’s log is the control log for all logs. Contractor is responsible for reviewing the Designer’s log and bringing any discrepancies to the Designer’s attention for resolution.

B. All correspondence, reports, schedules, applications for payment, fax items, etc., shall contain proper title of project, State ID #, and Designer’s project number.

C. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Only communications transmitted through the Architect will be deemed as project communications, upon which the Contractor may rely.

3.09 FOR REQUESTS FOR SUBSTITUTION, SEE:

A. Invitation to Bid.

B. General Conditions of the Contract.

C. Section 01 60 00 - Product Requirements.

D. Section 01 62 03 - Substitution or Alternate Materials Request.

3.10 FOR SUBMITTAL PROCEDURES, SEE:

A. Section 01 33 00 - Submittals.

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Final CPM schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

1.02 SUBMITTALS

A. Preliminary Project Schedule: Prepare preliminary critical path method (CPM) schedule as indicated in Article 14 of the General Conditions of the Contract and provide to Designer for review and comment.

B. Final CPM Schedule: No later than 15 days after the written Notice to Proceed, submit complete CPM schedule to Owner and Designer for review and approval.

C. Submit updated schedule with each Application for Payment.

D. If the work is greater than 30 days behind schedule, provide recovery schedule as required by the General Conditions of the Contract.

E. Submit in PDF format.

1.03 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CRITICAL PATH METHOD (CPM) SCHEDULE

A. Prepare CPM schedule in the form of a network analysis.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of each story or separate area and other logically grouped activities.

D. Indicate "total float" and "free float" for each activity.

E. Duration of individual work activities shall not exceed 14 days.

F. Indicate which part of the Contract Price is attributable to each activity on the schedule as required by Article 15 of the General Conditions of the Contract.

G. Provide sub-schedules to define critical portions of the entire schedule.

H. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

I. Weather Days: Include expected weather delay days until building dry-in as a separate activity in schedule, listed on as critical path item, based on expected weather as defined in Article 23 of the General Conditions of the Contract.

J. Startup and Testing Time: Incorporate commissioning activity milestones and activities; see additional schedule requirements in Section 01 90 00 - General Commissioning Requirements.

K. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the 25th day of each month.

L. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.

M. Include mock-ups and mock-up review dates in schedule, coordinated with scheduled installation of associated work. See Section 01 40 00 - Quality Requirements, article Mock-Ups.

N. Provide legend for symbols and abbreviations used.

3.03 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Monetary value of activity, keyed to Schedule of Values.
   12. Percentage of activity completed.
   13. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. Listing of activities on the critical path.
   4. Listing of Architect or Owner-observed testing or inspections.

3.04 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Distribute report on a biweekly basis to Owner and Designer showing the status of all activities with actual Work completed to date in comparison with the original Work scheduled for all activities.

D. Update diagrams to graphically depict current status of Work.

E. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

F. Indicate changes required to maintain Date of Final Acceptance.

G. Submit reports required to support recommended changes.

H. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

I. If the work is greater than 30 days behind schedule, provide plan of action and recovery schedule as required by the General Conditions. Provide plan of action within two (2) days of

receiving the Owner's written demand and recovery schedule within five (5) business days of receiving the Owner's written demand.

3.05 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, Commissioning Agent, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for submittals for review, information, and project closeout.

B. Timing and packaging of submittals.

C. Delivery of submittals.

1.02 SUBMITTALS

A. Submittal schedule.

1.03 ELECTRONIC DELIVERY OF PROJECT CORRESPONDENCE

A. Unless otherwise required or permitted, deliver project correspondence and documentation to the Architect via "Newforma Info Exchange" provided by the Architect at no cost to the Contractor.

B. Unless otherwise required or permitted, employ pdf format and create pdf documents using standard text/graphic conversion software such as Adobe or Bluebeam and employ bookmarks throughout the document for ease of navigation; manually scanned documents are not acceptable.

1.04 DEFINITIONS

A. Product Data: Manufacturer’s standard published literature necessary to demonstrate compliance with specified requirements. Product data may include descriptions, illustrations, standard schedules, performance charts, brochures, and diagrams. Where product data covers a range of product values (e.g. thickness or other dimension, density, compressive strength, or other characteristics) product data or other documentation shall identify applicable products, models, options, values, and other data.

B. Shop Drawings: Drawings, diagrams, schedules and other data specially prepared for the project by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. Where applicable, shop drawings shall indicate specific dimensions of products, configurations, utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. Shop drawings shall not be reproductions of Contract Documents.

C. Samples: Physical samples of actual product that illustrate functional and aesthetic characteristics of the product, materials, equipment, or workmanship to be provided in the project and that serve to establish standards by which compliance with the Contract Documents may be judged. Where samples are for selection from standard finishes, samples shall represent the full range of the manufacturer’s standard colors, textures, and patterns. Where samples are for verification of a proposed lot and contain a range of naturally occurring characteristics (e.g. wood veneer, stone, etc.), samples shall be representative of the run of material and in additional shall include the full range of anticipated variation.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.

1. Provide within fifteen consecutive calendar days of the Notice to Proceed as required by Article 5 of the General Conditions of the Contract.
2. Coordinate with Contractor's construction schedule.
3. Schedule submittals to expedite the Project and to coordinate submission of related items.

4. Schedule submittals for orderly review by the Architect. For each submittal for review, allow 20 calendar days from the date of receipt by the Designer. Submittals received by Designer after 1:00 p.m. will be considered as received the following business day.
5. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for initial product review, in-progress field data, project closeout), role and name of subcontractor if any.
6. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.02 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
    1. Product data.
    2. Shop drawings.
    3. Samples for selection.
    4. Samples for verification.
    5. Delegated design data submittals, certifications, and approvals.
    6. Other types when indicated in respective specification sections.

B. Architect's review is only for the limited purpose of checking for conformance with the information given and the design concept expressed in the contract documents.
    1. Architect's review is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

C. Delegated Design: Where the contract documents provide performance and design criteria and require that design services, certifications, or approvals be provided by a licensed professional, said professional shall be entitled to rely on the adequacy and accuracy of the performance and design criteria in the contract documents and the Owner and Architect shall be entitled to rely on the adequacy and accuracy of the design services, certifications, and approvals provided by said professional. Architect's review is only for the limited purpose of checking for conformance with the information given and the design concept expressed in the contract documents. Delegated Design professional is responsible for coordinating with surrounding work, including designing all required connections to supporting elements.

D. Contractor is responsible for determining and verifying materials, field measurements and field construction criteria related thereto, and checking and coordinating the information contained within the submittal with the requirements of the Work and of the Contract Documents.

E. Samples will be reviewed only for aesthetic attributes such as color, pattern, and texture.

3.03 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
    1. Design data.
    2. Sustainable design submittals and reports (Green Globes).
    3. Certificates.
    4. Test reports.
    5. Inspection reports.
    6. Manufacturer's instructions.
    7. Manufacturer's field reports.
    8. Other types when indicated in respective specification sections.

B. Submit for Architect's delivery to Owner.

C. Action taken by the Architect on informational submittals (whether "approval" or other action) indicates only that the item has been received in the form required by the contract documents and that the Architect will transmit the item to the Owner for the Owner's records, but does not indicate that the Architect has verified the accuracy or adequacy of the contents of the submittal.

3.04 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record submittals.
   2. Project record documents.
   3. Operation and maintenance data.
   4. Warranties.
   5. Bonds.
   6. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

C. Action taken by the Architect on project closeout submittals (whether "approval" or other action) indicates only that the item has been received in the form required by the contract documents, but does not indicate that the Architect has verified the accuracy or adequacy of the contents of the submittal.

3.05 TIMING AND PACKAGING OF SUBMITTALS

A. Submit complete, coordinated data. Partial submittals are not acceptable unless specifically exempted. For complex assemblies comprising components from two or more Specification Sections, submit data for all components of the assembly at the same time.
   1. Each submittal indicated in Specifications shall be transmitted as a separate electronic submittal in Newforma Info Exchange.
   2. Each submittal in Newforma Info Exchange shall be in the form of a single pdf file including cover sheet with Contractor's approval stamp.

B. Initial Product Information: For each Section of the Specifications, submit the initial product information listed below at the same time.
   1. Product data.
   2. Samples.
   3. Installer and manufacturer qualifications.
   4. Manufacturer's instructions.
   5. Certificates, test reports, and inspection reports of standard plant runs that demonstrate compliance of proposed products with specified quality.
   6. Similar submittals demonstrating quality of proposed products.

C. Initial Product Information for Products used in Interior Design: Submit initial product information and samples for all interior design products on the same date.

D. Initial Product Information for Wood Finishes: Submit initial product data information and samples for all interior and exterior wood and wood-grain finish products on the same date for concurrent review and selection, including but not limited to wood doors, wood ceilings, and wood-finish soffit and wall panels.

E. Shop Drawings and Design Data:
   1. Submit Shop Drawings and Design Data for each Section of the Specifications at the same time.
      a. Exception: Especially large quantities of drawings on large projects may be divided into individual submissions, such as package 1, 2, 3, etc.
   2. Submit the following prior to placing final order for fabrication:
      a. Detailed drawings prepared specifically for the project, for example drawings of concrete reinforcing, structural steel, curtain wall, equipment.
      b. Calculations or other designs prepared specifically for the project.

F. In-Progress Reports: Multiple submittals permitted. Submit the following in a timely manner as the work progresses.
   1. Certificates, test reports, and inspection reports of actual plant runs for this project (where required) or of tests and inspections made at the project site (earthwork, concrete, steel, etc.).
   2. Similar submittals recording actual quality installed on-site.

G. Project Closeout Submittals: Submit the following for each Section of the Specifications as a single package:
   1. Product record submittals.
   2. Test reports and inspection reports of completed work.
   3. Project record documents.
   4. Operation and maintenance data.
   5. Warranties and bonds.
   6. Final certificates.

3.06 DELIVERY OF SUBMITTALS

A. Initial Product Information, Shop Drawings, Design Data, and In-Progress Reports:
   1. Deliver documents electronically in pdf format.
      a. Include pdf bookmarks to indicate multiple sections of the document.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect. Submit a minimum of three samples, including one for the Owner and one to be retained by the Contractor on the job site for reference. Provide additional samples if required for subcontractors or other purposes.
   1. Retained samples will not be returned to Contractor unless specifically so stated.

C. Documents for Information:
   1. Deliver documents electronically in pdf format.

D. Documents for Project Closeout:
   1. Warranties, Bonds, and Executed Forms: Submit original (paper) executed documents plus electronic (pdf) copies.
   2. Testing, Balancing, Start-Up, and Operations and Maintenance Manuals:
      a. Submit documents in two (2) paper copies and one (1) USB drive with electronic files in pdf format.
      b. Provide one pdf file per Division containing all the products/equipment under that Division. Do not separate information based on subcontractor scopes.
      c. Each pdf file should contain: a detailed index containing a product/equipment list. As a subset to each product/equipment, the index should include the following categories with their associated page number references and content.
         1) Details: Name, address, contact, email and phone number for all associated parties including project, owner, designer, contractor, subcontractor/installer, and manufacturer.
         2) Specifications.
         3) Manuals.
         4) Warranties.
         5) Certificates.
      d. PDF file should be named with the following convention: Building Letter Designation: “O&M”: “Division #".
         1) Example O&M Division file name for Division 05 for Tech 4.0: ED O&M Division 05
   3. As-Built Drawings:
      a. Deliver drawings electronically in pdf format.
      b. Deliver drawings electronically in AutoCAD dwg format.
      c. Provide one full-size paper copy of drawings.

E. Submittal Procedures:

1. Transmit each submittal with approved form.
2. Number each transmittal with CSI specification number and suffix in the approved format.
3. Identify Project, Contractor, Subcontractor or supplier. Identify Specification Section number and pertinent drawing and detail number.
4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
5. Text of the Contractor's stamp shall not be effective to limit or reduce the Contractor's responsibilities for review and approval of submittals, including verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
    a. As indicated in Article 5 of the General Conditions of the Contract, approval of submittals by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the submittal.
6. Mark physical samples on unexposed side of material with identifying information including submittal number, material name, manufacturer, and finish, as well as Contract Document abbreviation where applicable. Include images of samples, including identification information, in electronic submittal submitted at same time as shipping samples to Architect's office. Review period for sample submittals will not begin until both electronic and physical submittals are received by Architect.
7. Deliver submittals to Architect.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
9. Schedule submittals for orderly review by the Architect. For each submittal for review, allow 20 calendar days for Architect's review unless Architect notifies Contractor that additional time is necessary for review on account of Contractor's scheduling of simultaneous submittals.
10. Identify variations from the Contract Documents.
11. When revised for resubmission, identify all changes made since previous submission.
12. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
13. Submittals not requested will not be processed.
14. Submittal of products that differ from what is specified in the Contract Documents and have not been previously approved in an Alternate Materials Request will be rejected.

3.07 REQUESTS FOR SUBSTITUTION

A. Refer to the following:
    1. General Conditions of the Contract OC-15.
    2. Section 01 60 00 - Product Requirements.
    3. Section 01 62 03 - Substitution or Alternate Materials Request.

END OF SECTION

SECTION 01 33 29.03 - SUSTAINABLE DESIGN REPORTING - GREEN GLOBES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General requirements for sustainable design reporting.

1.02 REPORTING REQUIREMENTS

A. Free-standing furniture and furnishings are not included in the Contract.

B. Contractor must familiarize himself with the relevant reporting requirements and provide the necessary information and instruction to all subcontractors and installers.

1.03 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: General submittal requirements.

B. Section 01 35 66.13 - Sustainability Certification Project Procedures - Green Globes.

C. Section 01 57 19 - Temporary Environmental Controls.

D. Section 01 60 00 - Product Requirements.

E. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

F. Section 01 74 19 - Construction Waste Management and Disposal.

1.04 DEFINITIONS

A. Definitions in this Article are in addition to sustainable design definitions directly related to products, as listed in Section 01 60 10 - Product Requirements for Sustainable Design.

B. Green Globes Assessor (GGA): Technical expert in the areas of sustainable design, construction, energy, and facility management, and who is certified and contracted by Green Building Initiative organization to perform independent third-party assessments for this prospective Green Globes certified project.

C. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of SMACNA (OCC) "IAQ Guidelines for Occupied Buildings Under Construction".

D. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.

1.05 PRODUCT REPORTING SCOPE

A. General: Product reporting scope for the purpose of achieving the selected sustainability certification level is limited to those items directly affecting ability to achieve targeted points.

1. Environmental Product Declarations (EPD): Documentation complying with definition and quality requirements in Section 01 60 00 - Product Requirements.

1.06 REFERENCE STANDARDS

A. GG (TRM-NC) - Green Globes for New Construction 2021 Technical Reference Manual, Version 1.0, October 2021.

B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.07 SUBMITTALS

A. Sustainable Design Documentation: The scope of required documentation is specified in this section and in applicable individual specification sections.

B. Green Globes Points - Documentation is required for the following items:

1. New Product Documentation: Use software tools and/or forms mutually agreed upon by Architect and project assessor; electronic copies of these to be made available to Contractor at preconstruction meeting. Use for documentation of GG (TRM-NC) Materials and Resources points.

a. Path A - Performance Path:
1) Submit Contractor's bill of materials for materials listed in the "Product Reporting Scope" Article.
2) For each item, include data for the following environmental performance life-cycle impact indicators:
(a) Global warming potential (GWP).
(b) Acidification potential.
(c) Eutrophication potential.
(d) Ozone depletion potential (ODP).
(e) Smog potential.
(f) Fossil fuel use.

2. Contractor's Environmental Management During Construction: Submit documentation of a environmental management system instituted and followed for the project. Include one or more of the required system components.
a. Contractor's environmental policy.
b. Regulatory compliance and training.
c. Environmental risk assessment showing sensitive environmental area and ranking of potential risks that may arise to them due to construction activities.
d. Environmental management roles, responsibilities, and reporting structure.
e. Site and work instructions for site personnel outlining environmental procedures during construction.
f. Environmental inspection checklists.
g. Records of compliance with system.

3. Waste Disposal Management: Periodic reports quantifying diversion of construction waste away from landfills and incineration facilities.
a. Include information on percentage of diverted material and number of material streams.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROCEDURES

A. Submit sustainable design documentation required of Contractor, using procedures defined under Submittals for Information in Section 01 30 00.

B. Submit sustainable design documentation to Architect, unless otherwise indicated.

C. Where an item of sustainable design documentation is specified, fill out and submit electronically the appropriate form(s), and/or use appropriate software.
1. Fill out one line for each different brand name product and each different manufacturer of a lot of commodity products.
2. Where required attachments are specified, attach the documentation.
3. Mark each blank with the appropriate information; use "ATT" for items attached; if any item is not relevant use the code "NR"; if any item is not available use the code "NA".

D. Each form must be signed by the entity capable of certifying the information.
1. Certification signatures must be made by an officer of the company.
2. For products, certification must be made by the manufacturer not the supplier.
3. For custom fabricated products, certification by the fabricator is acceptable.

E. Submit the completed forms in accordance with the requirements of Section 01 30 00, as information submittals.
1. Give each form a unique submittal number.
2. Do not combine sustainable design documentation with product data or shop drawing submittals.

F. Submit forms applicable to work for which application for payment is being made, either prior to or concurrent with application for payment; payment will not be made until relevant forms have been submitted.

G. For work covered by multiple applications for payment, the initial submittal of a form is sufficient for subsequent applications unless the nature of the product has changed.

END OF SECTION

SECTION 01 35 66.13 - SUSTAINABILITY CERTIFICATION PROJECT PROCEDURES - GREEN GLOBES

PART 1 GENERAL

1.01 PROJECT APPROACH

A. This project intends to achieve recognition for sustainable design using Green Globes Certification program.

B. Contractor is not responsible for the application for sustainability certification, nor for determination of methods of achieving sustainability credits unless specifically so indicated.

C. Many sustainability points can be achieved only through intelligent design of the project and are beyond the control of the Contractor. However, certain points relate to the products and procedures used for construction. Therefore, full cooperation of the Contractor and subcontractors is essential to achieving final certification goal, and therefore they must familiarize themselves with the relevant requirements, and provide the necessary information and instructions to product suppliers and installers

D. Since Contractor and subcontractors may not be familiar with detailed Green Globes sustainability procedures, this section includes a list of other specifications sections that contain related requirements for products and procedures necessary for achievement of targeted sustainability certification level.

1. Achievement of many points is dependent on proper performance by Contractor and subcontractors, using specific required project management and work execution means and methods.
2. Achievement of other points involves quantifying percentages of installed products by weight and cost; these require careful recordkeeping and reporting by the Contractor.
3. See www.thegbi.org for more information.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROCEDURES

A. General: Conduct project management and construction operations in a manner consistent with, and in support of successful achievement of Owner's targeted certification level.

1. Collect the cost information for materials and products.

B. Construction Waste Management and Disposal: Implement approved waste management plan during the entire duration of the Contract.

C. Commissioning Authority Activities: Cooperate with Commissioning Authority to coordinate construction and closeout activities scheduling.

D. Sustainable Design Reporting: Comply with requirements of Section 01 33 29.03.

E. Green Globes Assessor: Coordinate construction and closeout activities with Assessor's on-site assessment responsibilities.

1. Verification of Complying Construction: Where elements of construction are required to be incorporated in the work in a particular manner required for designed in-service performance, keep records of installation details and procedures.
   a. For elements of construction that become concealed from view prior to being visually inspected, or become unable to be tested without disturbing in-place construction, document as-built conditions using digital photographs and/or digital video. Make digital record available to the Assessor.

3.02 SMOKING POLICY

A. General: Smoking policy on the project site is implemented for the following reasons:

1. Protection and promotion of health of all persons on the project site.
2. Prevention of fire.
3. Prevention of exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke, resulting in build-up on hard surfaces, and absorption of smoke by textiles and fabrics.
4. Promotion of successful results of Indoor Air Quality

B. Smoking is permitted only in designated outdoor areas, located more than 25 feet (8 m) from any building entrances, exits, operable windows, or ventilation system fresh-air intakes.

C. Include explanation of smoking policy as part of orientation and safety training for every worker on the site.

D. Enforcement: Institute smoking policy enforcement measures.

3.03 CONSTRUCTION WASTE MANAGEMENT

A. Comply with applicable requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.04 TEMPORARY ENVIRONMENTAL CONTROLS

A. Comply with applicable requirements of Section 01 57 19 - Temporary Environmental Controls.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Mock-ups.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

F. Manufacturer's field services.

G. Defect assessment.

1.02 DEFINITIONS

A. Qualified Professional Engineer: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

1.03 REFERENCES

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2019).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2022.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.04 SUBMITTALS

A. Independent Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Test Reports: After each test/inspection, promptly submit report directly to Architect and to Contractor. Include:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and specifications section.
   6. Location in the Project.
   7. Type of test/inspection.
   8. Date of test/inspection.
   9. Results of test/inspection.

10. Conformance with Contract Documents.
11. When requested by Architect, provide interpretation of results.

C. Manufacturer's Field Reports: Submit reports for Architect's information and benefit as contract administrator.
1. Submit reports within 7 days of observation to Architect.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue specified in individual specification sections or, if none, the date current on the date of issue of the Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent agency to perform specified testing and inspection where indicated in individual Sections.

B. Contractor shall employ and pay for services of an independent agency to perform all other specified testing and inspection.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Independent Agency Qualifications:
1. Testing Agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740 as applicable to the nature of the testing.
2. Maintain a full time registered engineer on staff to review services.
3. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

H. Contractor shall review the work for compliance with the Contract Documents and enforce such requirements on their Subcontractors. Contractor shall maintain a log of all deficiencies noted in the work, indicating when it was noted, when the appropriate Subcontractor was notified, and when the Contractor confirmed that it was corrected. Contractor shall make this log available to the Designer upon request.

3.02 MOCK-UPS

A. Intent of mock-ups is to ensure that the Owner, Contractor, and Designer have a chance to reach a comfort level with the proposed design and construction of the indicated building element prior to its installation. Contractor to coordinate installation of mockup as early in construction schedule as possible to allow maximum opportunity to adjust details and methods without unnecessary impact to cost and schedule.

B. Wherever a mock-up is required by the Contract Documents, construct mock-up and obtain the approval of the Architect before constructing the remainder of the Work.

C. Testing may be performed under provisions identified in the respective product specification sections and as otherwise directed by the Architect..

D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

E. Make revisions, corrections, and adjustments to the mock-up as necessary to fulfill the intent of the mock-up.

F. Approved mock-ups (in conjunction with the other requirements of the Contract Documents) shall be a standard of quality for judging the Work.

G. If mock-up is specified to be removed, remove and dispose of the mock-up only after mock-up has been approved by Architect and when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. See Section 01 91 25 - Building Enclosure Commissioning for additional requirements.

C. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

D. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

E. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work .
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Provide reasonable notice to Architect and laboratory of expected time for operations requiring testing/inspection services to permit Architect and testing laboratory to schedule their activities.
   5. Employ and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

G. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections or when requested by the Architect, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, and testing, adjusting, and balancing of equipment, and to initiate instructions when necessary.

B. Manufacturer's representatives shall report to the Architect any observations and site decisions or instructions given to the Contractor or installers that are supplemental or are contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to the Contract Documents.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment with the consent of the Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 41 00 - SPECIAL INSPECTION SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for Special Inspection services.

B. Certain structural components of the Project will be subject to the requirements for Special Inspections. Special Inspections will be applicable to the following specification sections:

1. Section 03 30 00 Building Cast-In-Place Concrete
2. Section 05 12 00 Structural Steel Framing
3. Section 05 31 00 Steel Decking
4. Section 05 40 00 Cold-Formed Metal Framing
5. Section 07 81 00 Applied Fireproofing
6. Section 07 84 00 Firestopping
7. Section 31 20 00 Earth Moving

C. The Owner will procure and bear all costs of the Special Inspector and the Independent Testing Laboratory, except as otherwise noted. The Special Inspector will be the manager of the Special Inspection process. The Special Inspector checks the certification of all other inspecting agents required by Special Inspections and coordinates their activities. The Special Inspector carries the responsibility for coordinating Special Inspections. The Statement of Special Inspections will be required by the Building Official as a condition for building permit issuance.

D. Requirements for Special Inspections are outlined in the Statement and Schedule of Special Inspections included at the end of this section.

1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Special Inspections are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

F. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Quality Control" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.02 RESPONSIBILITIES

A. Contractor Responsibilities: Contractor shall provide and include in the Contract Sum, inspections, tests, and other similar quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction except where they are specifically indicated to be the Owner’s responsibility, or are provided by another identified entity.

1. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

a. The Contractor shall correct deficiencies in work that inspections and laboratory test reports have indicated to be not in compliance with requirements.

b. The cost of retesting and reinspection construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on

original construction indicated noncompliance with Contract Document requirements.

2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
    a. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
    a. Provide access to the Work.
    b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
    c. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
    d. Provide and maintain for the sole use of the Special Inspector or Inspectors adequate facilities for safe storage and proper curing of test samples on the Project Site.
    e. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
    f. Provide security and protection of samples and test equipment at the Project Site.
    g. The Contractor shall designate a representative (the superintendent or an assistant to the superintendent) who shall be the direct point-of-contact with the Special Inspector during each phase of the work. Discrepancies noted during the progress of the work will be reported to the Contractor’s representative for corrective action. Communications given by the Special Inspector to the Contractor’s representative shall be as binding as if given to the Contractor.

B. Special Inspector Responsibilities:
1. The Special Inspector shall coordinate and/or conduct and interpret tests, state in each report whether test specimens comply with requirements, specifically state any deviations therefrom, and record work required and performed to correct deficiencies.
2. The Special Inspector will keep records of all inspection and tests which will be furnished to the Building Official, the Architect, and the Structural Engineer of Record.
3. The Special Inspector shall notify the Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services. All discrepancies will be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies will be brought to the attention of the Owner, Building Official, Architect and the Engineer of Record.
4. A final report documenting completion of all required special inspections and corrections of any discrepancies noted will be submitted to the Building Official by the Special Inspector prior to, and as a condition of, issuance of the *Certificate of Use and Occupancy*.
5. The Special Inspector shall not perform any duties of the Contractor.
6. The Special Inspector shall not release, revoke, alter, decrease or increase the Contract Document requirements.

C. Independent Testing Laboratory Responsibilities: The Independent Testing Laboratory engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the Labortory’s duties. The Laboratory shall provide qualified personnel to perform required inspections and tests.
1. Notify Architect, Engineer of Record, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Shall not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.03 SUBMITTALS

A. Within 48 hours of each inspection or test, the Special Inspector and the Independent Testing Laboratory shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect and Engineer of Record.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.04 QUALITY ASSURANCE

A. Qualification for Special Inspector: The Special Inspector shall be a Registered Professional Engineer, Licensed in the State of North Carolina, experienced in performing special inspections and shall be approved by the Building Offical and the Architect. The credentials of all Inspectors and testing technicians shall be provided if requested.

B. Qualifications for Independent Testing Laboratory: Engage independent inspection and testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.
2. Each independent Inspection and Testing Agency engaged on the Project shall demonstrate that it has the experience and capability to conduct the required field and

laboratory testing without delaying the progress of the work. The minimum requirements shall be as follows:

a. Reinforced Concrete testing
   1) ACI-CFTT *Concrete Field Testing Technician – Grade 1*
   2) ACI-LTT *Laboratory Testing Technician – Grade 1 or 2* and *Strength Testing Technician*
   3) NICET-CT – *Concrete Technician – Level I, II, III, IV*

b. Reinforced Concrete Inspection
   1) ACI-CCI *Concrete Construction Inspector*
   2) ICC-RCSI *Reinforced Concrete Special Inspector*

c. Structural Steel
   1) AWS-CWI *Certified Welding Inspector*
   2) AWS/AISC-CSI *Certified Steel Inspector*
   3) ICC-SWSI *Structural Steel and Welding Inspector*

d. Non-Destructive Testing – American Society of Non-Destructive.

e. Structural Masonry
   1) ICC-SMSI *Structural Masonry Special Inspector*

f. Spray-Applied Fireproofing
   1) ICC-SFSI *Spray-Applied Fireproofing Special Inspector*

g. Prestressed Concrete
   1) ICC-PCSI *Prestressed Concrete Special Inspector*

h. Soils Testing
   1) NICET-ST- *Soils Technician Level III*
   2) NICET-GET – *Geotechnical Engineering Technician Level III*

i. Exterior Insulation and Finish Systems (EIFS)
   1) EDI – *EIFS Third Party Inspector*

E. Pre-Construction Conference – Prior to the start of project construction, the Special Inspector shall conduct a Pre-Construction Conference to discuss the requirements for Special Inspections as well as the Administrative Procedures to be followed during the course of the project. Protocols for notification, documentation, and individual responsiblilities shall be reviewed. Attendees shall include, but are not limited to:
   1. Owner
   2. Owner's Project Manager
   3. Owner's Project Inspector
   4. Owner's Independent Testing Agency
   5. Architect
   6. Structural Engineer
   7. Contractor's Project Manager
   8. Contractor's Superintendent

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01 43 40 - EXTERIOR WALL MOCK-UP

PART 1 GENERAL

1.01 MOCK-UPS

A. Construct a free-standing mock-up of the exterior wall on separate, independent foundation. Size and configuration as illustrated on the Drawings.

B. Construct a complete exterior wall assembly including foundation, back-up, weather and thermal protection, exterior cladding, openings, anchorage devices, flashings, seals, and finishes.

C. Include a portion of the mock-up that is "layered" so as to expose to view the various components such as back-up, weather and thermal protection, exterior cladding, opening details, anchorage devices, flashings, seals, and finishes.

D. Tests may be performed as identified in the respective product specification sections and as otherwise directed by the Architect.

E. Approved mock-ups (in conjunction with the other requirements of the Contract Documents) shall be a standard of quality for judging the Work.

F. Remove mock-up and clear the area only when all of the following have been satisfied: 1) When mock-up has been accepted by Architect, 2) the date of Final Acceptance has passed (unless waived by the Architect or Owner), and 3) Architect directs in writing to remove mock-up.

1.02 SCHEDULING

A. Provide notice to the Architect of the anticipated starting and ending times and dates when each material included in the mock-up will be constructed, so that the Architect may observe the installation of such materials prior to covering with subsequent materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. As specified in respective specification sections.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. As specified in respective specification sections, and in accordance with the typical details illustrated for permanent work.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary closures.

D. Temporary vehicular access and parking.

E. Project waste removal.

F. Project signs and identification.

G. Temporary field offices.

1.02 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain temporary toilets. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations .

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way .

C. Protect the vehicles of others, stored materials, site, and structures from damage.

1.05 FENCING

A. Construction: Commercial grade chain link fence.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

E. Existing parking areas located at site may be used for construction parking to extent allowed by Owner.

F. Designate two parking spaces close to trailer for Owner and Architect use.

1.08 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.09 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on Drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.10 FIELD OFFICES

A. Office: Weather tight, with lighting, electrical outlets, HVAC, sturdy furniture , drawing rack, and drawing display table.

B. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

C. Provide space for Project meetings, with table and chairs to accommodate 15 persons, with display screen, camera, and internet connection allowing for remote participation in meetings.

D. Provide, maintain and pay for a dedicated conference phone for field office conference room beginning at time of project mobilization. Mobile phones are not an acceptable alternative.

E. Provide furnishings for office of Owner and Architect:
   1. One desk 54 x 30 inch (1.4 x 0.75 m), with three drawers.
   2. Two swivel arm chairs.
   3. One waste basket per desk and table.

F. Provide high speed internet service within field office for use of Owner, Contractor, and Architect.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials they are no longer required.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 19 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.04 REFERENCE STANDARDS

A. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology); 2021.

B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

C. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air; 1990.

D. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; 1999.

E. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

A. Sustainability Documentation: Submit documentation required in this section.
   1. For Green Globes certification system projects, submit in accordance with procedures specified in Section 01 33 29.03 - Sustainable Design Reporting - Green Globes.

B. Indoor Air Quality Management Plan: Describe, in detail, measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.

4. Identify areas of project potentially affected, especially occupied areas.
5. Evaluate potential problems by severity and describe methods of control.
6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
7. Describe cleaning and dust control procedures.
8. Describe coordination with commissioning procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus.
5. Sampling methods.

F. Air Contaminant Test Reports: Show:
1. Location where each sample was taken, and time.
2. Test values for each air sample; average the values of each set of 3.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See Section 01 61 16.

B. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
2. Exhaust directly to outside.
3. Seal HVAC air inlets and outlets immediately after duct installation.

D. Do not store construction materials or waste in mechanical or electrical rooms.

E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
1. Inspect duct intakes, return air grilles, and terminal units for dust.
2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
3. Clean tops of doors and frames.

4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
5. Clean return plenums of air handling units.
6. Remove intake filters last, after cleaning is complete.

F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

G. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 AIR CONTAMINANT TESTING

A. Perform air contaminant testing before occupancy.

B. Do not start air contaminant testing until:
1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. New HVAC filtration media have been installed.

C. Indoor Air Samples: Collect from spaces representative of occupied areas:
1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet (2300 square meters); take samples from areas having the least ventilation and those having the greatest presumed source strength.
3. Collect samples from height from 36 inches (915 mm) to 72 inches (1830 mm) above floor.
4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
6. When retesting the same building areas, take samples from at least the same locations as in first test.

D. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

E. Analyze air samples and submit report.

F. Volatile Organic Compounds Limits:
1. Formaldehyde: Not more than 27 parts per billion.
2. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.
3. Chemicals Listed in CAL (CDPH SM) Table 4-1, other than Formaldehyde: Not more than allowable concentrations listed in Table 4-1.

G. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6A.
2. Particulates: EPA 600/4-90/010 Method IP-10.
3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Prohibition of asbestos-containing materials.

C. Storage and protection.

D. Product option requirements.

E. Substitution requirements and procedures.

F. Procedures for Owner-Furnished-Contractor-Installed products.

G. Spare parts and maintenance materials.

1.02 RELATED REQUIREMENTS

A. Instructions to Bidders and General Conditions of the Contract OC-15: Product options and substitution procedures.

B. Section 01 62 03 - Substitution and Alternate Materials Request: Substitution or alternate products, materials, equipment, assemblies, or installation methods form.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products that contain 1 percent or more by weight of asbestos (asbestiform varieties of chrysotile (serpentine), crocidolite (riebeckite), amosite (cummingtonite-grunerite), anthophyllite, tremolite, or actinolite)).

C. All electrical materials, devices, appliances and equipment provided for the Work shall be evaluated for safety and suitability for intended use. Evaluation shall be conducted by a Nationally Recognized Testing Laboratory (NRTL), and all markings, labels and other identification required by those listings and certifications shall be provided on those materials, devices, appliances and equipment. If provided material is not labeled, Contractor shall provide third-party listing at no additional cost.

1. Third Party Agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to Label Electrical and Mechanical Equipment. Refer to NC Office of State Fire Marshal web site for current list of acceptable third party agencies.
   a. https://www.ncosfm.gov/third-party-testing-agencies

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only, without naming a manufacturer or brand name product: Use any product meeting those standards or description, and comply with the remaining requirements of the project.

B. Products Specified by Naming One or More Brand Name Products: Use one of the brand name products specified, and comply with the remaining requirements of the project.

C. Products Specified by Naming One or More Manufacturers: Use products of one of the manufacturers specified, and comply with the remaining requirements of the project.

D. Products Specified by Naming a "Basis of Design": A specific manufacturer's product is named and accompanied by the words "basis of design", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating products of other named manufacturers. Use the product named as "basis of design", or obtain the approval of the Architect of specific products by other manufacturers listed in the specification.

1. Where characteristics of equivalent product differ from Basis of Design product and require modification of surrounding work or associated services, Contractor shall provide required work at no additional Cost to Owner.

E. Basis of Design as Related to Interior Design Products:
1. The design of interior products is based not only on performance, durability, and similar criteria, but also on visual criteria such as color, texture, and pattern. The Architect has coordinated all of the interior products designated as “basis of design” to achieve a specific aesthetic intent. Where in addition to a “basis of design”, two or more manufacturer's products or materials are specified to provide competition in the marketplace, the Architect has selected products that are equally acceptable on the basis of performance, durability, and similar criteria, but has not selected products of which any and all possible combinations will achieve an acceptable aesthetic. For example, nine interior products with three manufacturers's products each may be combined in 3 to the 9th power ways, or over 19 thousand combinations, many of which will not achieve an acceptable aesthetic.
2. When providing interior products for the project, the Contractor shall either:
a. Provide all interior products identified as “basis of design”, or
b. Provide a mixture of interior products selected by the Contractor from the basis of design and other acceptable products listed in the specification.
3. In this second case, the Contractor shall submit for the approval of the Architect specific products by other manufacturers listed in the specification, following the procedures specified for substitutions, and this may prompt the Architect to reselect interior products within the same style, line, and series of the proposed products in order to achieve the desired aesthetic and the Contractor shall provide same at no change in contract time or price.

2.03 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to and place in location as directed; obtain receipt prior to final payment.

2.04 MANUFACTURER QUALIFICATIONS AND INSTALLER QUALIFICATIONS

A. The qualifications for manufacturers and for installers specified in the respective specification sections are requirements of the Contract.

PART 3 EXECUTION

3.01 PRE-BID SUBSTITUTION PROCEDURES

A. The Architect in the Architect's sole discretion may reject or take no action on a pre-bid request for substitution.

B. For time restrictions on pre-bid substitution requests see the Instructions to Bidders and General Conditions of the Contract OC-15.

C. Substitutions after the award of contract may occur only when:
1. The specified product, assembly, or method of construction cannot be provided within the Contract Time.
2. The specified product, assembly, or method of construction is discontinued and is no longer available in the marketplace.
3. Force majeure prevents the use of the specified product, assembly, or method of construction.

D. Approval of pre-bid substitutions will be made by addendum.

E. Substitution Submittal Procedure:
1. Submit a request for substitution for consideration. Limit each request to one proposed substitution.
2. Accompany requests with a completed Substitution or Alternate Materials Request form as specified in Section 01 62 03, and provide documentation required by that form.

3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
4. The Architect will notify Contractor in writing of decision to accept or reject request, and when approved will incorporate the change into the Contract Documents.

F. A request for substitution constitutes a representation that the submitter:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

3.02 REQUESTS FOR ALTERNATE MATERIALS PROCEDURES

A. The Designer in the Designer's sole discretion may reject or take no action on a request for use of alternate products, materials, equipment, assemblies, or installation methods.

B. Approval of alternate materials after the award of Contract may occur only with approval of Owner by Contract modification.

C. Requests for alternate materials as allowed by the General Conditions of the Contract will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request complying with the requirements specified herein. Requests must be approved in advance of associated submittals.

D. Alternate materials requests may only be submitted by the Contractor. Contractor must review and approve submittal and sign request form.

E. Provide all information required under Pre-Bid Substitution Procedures above. Proposed alternate products, materials, equipment, assemblies, or installation methods must indicate detailed explanation of added benefit to Owner as required by General Conditions.

3.03 PRODUCTS SUPPLIED BY OWNER

A. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 60 10 - PRODUCT REQUIREMENTS FOR SUSTAINABLE DESIGN

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Definitions of selected sustainable design terms.

B. Sustainable design-related product requirements.

C. These requirements are in addition to - not in lieu of - requirements specified in Section 01 60 00 and elsewhere in the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Section 01 33 29.03 - Sustainable Design Reporting - Green Globes: Reporting requirements.

B. Section 01 35 66.13 - Sustainability Certification Project Procedures - Green Globes: Requirements for Green Globes procedures.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. ASTM D6866 - Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis; 2022.

C. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association; 2019.

D. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; Current Edition.

E. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

F. CAN/CSA Z809 - Sustainable Forest Management; 2016 (Reaffirmed 2021).

G. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products; 2014.

H. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; Current Edition.

I. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; Current Edition.

J. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures; 2006.

K. ISO 14040 - Environmental Management - Life Cycle Assessment - Principles and Framework; 2006, with Amendment (2020).

L. ISO 14044 - Environmental Management - Life Cycle Assessment - Requirements and Guidelines; 2006, with Amendment (2020).

M. ISO 21930 - Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services; 2017.

N. NSF 332 - Sustainability Assessment for Resilient Floor Coverings; 2015.

1.04 SUBMITTALS

A. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.

1. See Section 01 33 29.03 for Contractor's reporting necessary for achievement of targeted Green Globes certification level.
2. See Section 01 35 66.13 for Contractor's procedures necessary for achievement of targeted Green Globes sustainability certification level.

1.05 DEFINITIONS

A. Bio-Based Content: Of vegetable or animal origin, not including products made by killing the animal.
   1. Determine percentage of bio-based content in accordance with ASTM D6866.
   2. Bio-based content must be sourced from a Sustainable Agriculture Network certified farm.

B. CAL (CDPH SM) v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.

C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including successive stages of processing, transformation, manufacturing, and distribution.

D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer’s product and the product’s supply chain.

G. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).

H. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
   1. Good: Product-specific; compliant with 1.
   2. Better: Industry-wide, generic; compliant with 4, or with 3, 2, 1, and 5; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.

I. GreenScreen Chemical Hazard Analysis: Ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
   1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
   2. Better: GreenScreen Full Assessment.
   3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
   4. Acceptable Evidence: GreenScreen report.

J. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the 1 online tools.

K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other programs approved by sustainability certification system used for the project.

L. Manufacturer's Inventory of Product Content: Publicly available inventory of every ingredient identified by name and Chemical Abstract Service Registration Number (CAS RN).
   1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.

M. Multi-Attribute Certifications: Lifecycle-based environmental certifications that indicate that a product has undergone rigorous scientific testing, exhaustive auditing, or both, to prove its compliance with stringent, third-party, environmental performance standards. Third-party certifications include the following:
   1. ANSI/NSC 373: Sustainable Production of Natural Dimension Stone.
   2. BIFMA e3 - Furniture Sustainability Standard.
   3. Green Squared/ANSI A138.1 – 2011 v2 for ceramic tile, Glass Tiles and Tile Installation Materials.
   4. NSF/ANSI 140 – 2015 – Sustainability Assessment for Carpet.
   5. NSF 332 - Sustainability Assessment for Resilient Floor Coverings.
   6. NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric.
   7. NSF/ANSI 342 – 2014 Sustainability Assessment for Wallcovering Products.
   8. NSF/ANSI 347 - 2012a Sustainability Assessment for Single Ply Roofing Membranes.
   9. UL 100 first edition (2012) Standard for Sustainability for Gypsum Board and Panels.
   10. UL 102 Sustainability Assessment for Swinging Door Leafs.
   11. UL (STP) 106: Sustainability for Luminaires.
   12. UL (STP) 115: Sustainability for Thermal Insulation.

N. Rapidly Renewable Materials: Made from agricultural products that are typically harvested within a 10-year or shorter cycle.

O. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
   4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
   5. Acceptable Evidence:
      a. For percentage of recycled content, information from manufacturer.
      b. For cost, Contractor's cost data.

P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles (160.9 Km) from the Project site.

Q. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
   1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
   2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

R. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
   1. In every case, indicate the location of final assembly.
   2. For harvested products, indicate location of harvest.
   3. For extracted (i.e. mined) products, indicate location of extraction.
   4. For recovered products, indicate location of recovery.
   5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
   6. Acceptable Evidence:
      a. Manufacturer's certification.

b. Life cycle analysis (LCA) performed by third-party.

S. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
1. American Forest Foundation, The American Tree Farm System; refer to http://www.treefarmsystem.org.
2. Canadian Sustainable Forest Management System, under CAN/CSA Z809; refer to http://www.csasfmforests.ca.
3. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit http://www.fsccanada.org, for the USA visit http://www.fscus.org.
4. Sustainable Forestry Board, under The Sustainable Forestry Initiative® of the American Forest & Paper Association; refer to http://www.afandpa.org.
5. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Once the other requirements of the Drawings and Specifications are met, Contractor shall give preference to products that achieve the Projects sustainability goals, including but not limited to:
1. If used on interior, have lower emissions, as defined in Section 01 61 16.
2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Have longer documented life span under normal use.
5. Result in less construction waste. See Section 01 74 19
6. Are made of vegetable materials that are rapidly renewable.
7. Are made of recycled materials.
8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
9. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
10. Are Cradle-to-Cradle Certified.
11. Have a published Environmental Product Declaration (EPD).
12. Have a published Health Product Declaration (HPD).
13. Have a published GreenScreen Chemical Hazard Analysis.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 61 16 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Products making up wall and ceiling assemblies.
   5. Thermal and acoustical insulation.
   6. Casework and millwork.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

G. GreenSeal GS-36 - Standard for Adhesives for Commercial Use; 2013.

H. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2017).

J. SCS (CPD) - SCS Certified Products; Current Edition.

K. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.04 SUBMITTALS

A. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

B. Sustainable Design Reporting: Submit evidence of compliance.
   1. Refer to Section 01 33 29.03 - Sustainable Design Reporting - Green Globes.

1.05 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days; or UL 2821 GREENGUARD Certification Program Method for Measuring and Evaluating Chemical Emissions from Building Materials, Finishes and Furnishings, 2013.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Certification by manufacturer that product complies with requirements.
      c. Certification by a third party testing organization including, but not limited to, one of the following:
         1) UL EcoLogo - UL Environment.
         2) UL 2760 Sustainability for Surface Coatings: Recycled Water-borne, 2011.
         3) UL 2762 Sustainability for Adhesives, 2011.
         4) UL 2768 Standard for Sustainability for Architectural Surface Coatings, 2011 Green Seal.
         5) Green Seal GS-11 Environmental Standard for Paints and Coatings, 2013.
         6) Green Seal GS-26 Adhesives for Commercial Use, 2013.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.

3. Joint Sealants: SCAQMD 1168 Rule.
4. Paints and Coatings: Each color; most stringent of the following:
   a. 40 CFR 59, Subpart D.
   b. SCAQMD 1113 Rule.
   c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 62 03 - SUBSTITUTION OR ALTERNATE MATERIALS REQUEST

TO: LORD AECK SARGENT PLANNING & DESIGN, INC.

[ ] Substitution of the following is hereby requested in accordance with the General Conditions of the Contract and Section 01 60 00.

[ ] Use of the following alternate product, material, equipment, assembly, or installation method is hereby requested in accordance with the General Conditions of the Contract and Section 01 60 00.

[ ] The following product, material, equipment, assembly, or installation method is considered equal by the bidder to those specified in the Contract Documents in all respects (physical, functional, and aesthetic).

SPECIFIED PRODUCT:

SECTION NUMBER: PAGE NUMBER: PARAGRAPH NUMBER:

REASON FOR REQUEST; CHECK ONE OR MORE:

[ ] Contractor cannot provide the specified product, assembly, or method of construction within the Contract Time;

[ ] The proposed product complies with the contract documents in every respect except for the specified manufacturer name or brand name or model number.

[ ] The requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume;

[ ] Other (explain):

PROPOSED PRODUCT INFORMATION:

Manufacturer:

Address:

Product trade name, model number, other characteristics:

Name of fabricator or supplier:

Address:

CHECK ONE:

[ ] The proposed product complies with the contract documents in every respect except for the specified manufacturer name or brand name or model number.

[ ] The proposed product material complies with the contract documents in every respect except for deviations which are as follows:

CHECK ONE:

[ ] No changes are required in other work or products if the substitute product is approved.

[ ] Changes will be required in other work or products, if the substitute product is approved, as follows:

MAINTENANCE SERVICES AND REPLACEMENT MATERIAL AVAILABILITY (IF APPLICABLE):

CHECK ONE:

[ ] No change in the Contract Price is proposed.

[ ] Modification of the Contract Price by adding $ _____ is hereby requested.

[ ] Modification of the Contract Price by subtracting $ _____ is hereby requested.

CHECK ONE:

[ ] No change in the Contract Time is proposed.

[ ] Modification of the Contract Time by adding _____ calendar days is hereby requested.

[ ] Modification of the Contract Time by subtracting _____ calendar days is hereby requested.

CERTIFICATION:

The undersigned warrants to the Owner, to the Architect, and to other contractors and their subcontractors (if any) that the undersigned:

- has examined the Contract Documents for the project,

- has investigated the proposed product and has found it to be equal or superior in all significant respects to the specified product,

- will provide the same warranty for the proposed product as for the specified product,

- will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including, redesign, additional components, and additional capacity required by other work affected by the change, and

- waives all claims for additional costs and time extensions which subsequently may become apparent and which are caused by the change.

- Will reimburse Owner for review or redesign services, when request is made after the award of contract.

ENCLOSURES:

The following complete information is enclosed for evaluation:

1. Product data on the proposed substitution.
2. A detailed cost breakdown itemizing the costs of the specified product and a detailed cost breakdown itemizing the costs of the proposed substitute product. Include each of the following:
    a. Quantities of materials and the cost thereof.
    b. Shipping to the site.
    c. Manhours of labor and hourly cost including payroll taxes, insurance, and benefits for each skill or labor classification.
    d. Quantities and costs of equipment, tools, and other material not incorporated into the work.
    e. Overhead and profit.
    f. Credit for deletions from Contract, similarly documented.
3. Justification for any change in Contract Time.

4. For alternate materials, clear benefit to the Owner as required by the General Conditions of the Contract.
5. Other information requested by the Architect.

Other enclosures:

THIS REQUEST IS SUBMITTED IN THE NAME OF:

Company name:

Address:

Telephone:

BY:

Authorized Signature:

Date:

Typed Name:

Title:

END OF SECTION

SECTION 01 70 00 - EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Punch list process.

I. SCO Final Inspection.

1.02 SUBMITTALS

A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
3. Submit surveys and survey logs for the project record.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.03 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

D. Rodent and Pest Control: Provide methods, means, and facilities to prevent rodents and pests and insects from accessing or invading premises.

E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and

conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. Notify Architect sufficiently in advance of meeting date to allow for coordination with Architect's schedule.

B. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

C. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, elevations of construction, and site work.

L. On completion of interior and exterior stairs and ramps, prepare a certified survey illustrating dimensions, angles, elevations of construction, and site work as required to show compliance with NC Building Code and accessibility code requirements.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

F. Unless specific construction tolerances have been identified in the Contract Documents, the Contractor shall construct the work in accordance to normal industry or trade construction tolerances and the manufacturer’s installation instruction. Any costs associated with compliance to normal or specified construction tolerances are the responsibility of the Contractor.

3.06 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

J. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash from the site without delay; dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Owner and Architect sufficiently in advance of start-up of each item to permit coordination of their schedules.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Prior to Final Acceptance, demonstrate to Owner's personnel the start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at designated location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season near the onset of the other season.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. Provide digital video recording of each training session in MTS format. Video title should include the building letter designation followed by the equipment name.
   1. Example: For a generator training video for Tech 4.0 – Video Name: “ED – Generator"

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Inspection of subcontractor work by Contractor to ensure quality control is required prior to notification of Owner and Designer that work is completed.

B. Upon completion of the building, or an area of the building, Contractor shall perform a detailed quality control inspection of area noting all deficiencies to be corrected. Contractor shall provide report of such inspection to Architect with an estimate of time required to make corrections. When deficiencies are corrected, Contractor may request Architect to perform a complete review of building or space. If Architect finds a greater number of deficiencies than originally noted by Contractor in any portion of completed work, or if Architect finds that more than 5% of the items on the Contractor’s punch list have not been corrected, Architect shall stop final review and notify Contractor that work is not complete. Contractor will be responsible for any costs incurred by the Owner for additional fees resulting from punch list inspections beyond one initial inspection and one re-inspection for any building or space.

C. Preparation: Submit list of incomplete items in MS Excel electronic file in format provided by Architect. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3.13 FINAL CLEANING

A. Clean areas to be occupied by Owner prior to Final Completion and Final Acceptance before Owner occupancy. Comply with requirements in Section 00 80 10.

B. Use cleaning materials that are nonhazardous. See Section 00 80 11 for list of approved products.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces, dust and mop hard flooring.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean permanent washable filters and replace disposable filters of operating equipment.

F. Clean debris from roofs, gutters, scuppers, downspouts, overflow drains, and other elements of storm drain systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 SCO FINAL INSPECTION

A. Notify the Designer in writing when project is complete and ready for inspection, including completion of all items noted on the punch list.

B. Provide affidavits, consent of surety, and any other information required by the Designer in order to compile project documentation and to provide certifications required by State Construction Office prior to scheduling SCO Final Inspection.

C. See Article 25 of the General Conditions of the Contract for additional information.

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

E. Develop and follow a Waste Management Plan designed to implement these requirements.

F. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. Sustainable Design Submittals: Submit Waste Management Plan and Waste Disposal Reports in accordance with procedures specified in Section 01 35 66.13 - Sustainability Certification Project Procedures - Green Globes.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   5. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards (cubic meters).
      c. Include weight tickets as evidence of quantity.

6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Commissioning (Cx) Plan is included as an Attachment for reference and is considered part of the contractual requirements for this project.

1. Introduction
    a. Definition of Commissioning
    b. Commissioning Goal
    c. Purpose of the Commissioning Plan
2. Roles and Responsibilities of the Commissioning Team
3. The Commissioning Process during Construction
4. Systems to be Commissioned
5. Appendices
    a. Preliminary Commissioning Activity Durations
    b. Sample Pre-functional Checklists
    c. Sample Functional Performance Testing Procedures

1.2 SUMMARY

A. This section includes general requirements that apply to implementation of commissioning (Cx) without regard to specific systems, assemblies, or components. In the event of any conflicts or ambiguities between or among this specification section and other portions of the Contract Documents, including other specifications, then the stricter, greater, or higher quality requirement shall control.

B. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner’s operational needs. This is ideally achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the Warranty Phase with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing and performance testing and training.

C. Commissioning during the Construction Phase is intended to achieve the following specific objectives in accordance with the Contract Documents:

1. Verify that the submittals for the equipment and systems to be commissioned meet the design intent and specifications.
2. Verify that applicable equipment and systems are installed according to the manufacturer’s recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by the CM/GC and/or its installing subcontractors (hereinafter collectively referred to as the “Contractor”).
3. Verify and document proper performance of equipment and systems.
4. Verify that Operation and Maintenance (O&M) documentation is complete and delivered to the Owner.

D. The commissioning process is not intended to relieve the system designers or the Contractor of their obligations, including but not limited to their responsibility to provide a finished and fully

functioning product. The Commissioning Authority (CxA) is hired directly by the Owner not the Contractor. All contractor responsibilities related to the commissioning process shall be included in the Contractor's base bid.

E. Related Sections:
1. Division 01 Section "Submittal Procedures" for additional detail in submittals required for commissioning.
2. Division 01 Section "Closeout Procedures" which defines substantial completion and functional completion, relative to commissioning.
3. Division 01 Section "Operation and Maintenance Data" defines commissioning documentation requirements.
4. Division 01 Section "Building Enclosure Commissioning Requirements" for commissioning process activities for building enclosure systems, assemblies, equipment, and components.
5. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
6. Division 23 Section "Commissioning of Mechanical" for commissioning process activities for mechanical systems, assemblies, equipment, and components.
7. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

F. Abbreviations - The following are common abbreviations used in the Specifications and in the Commissioning Plan:
1. A/E Architect and Engineer of Record
2. AHJ Authority Having Jurisdiction
3. BOD Basis of Design
4. BECx Building Enclosure Commissioning
5. BECxP Building Enclosure Commissioning Professional
6. CC Controls Contractor
7. CxA Commissioning Authority or Agent
8. Cx Commissioning
9. CxC Commissioning Coordinator
10. Cx Plan Commissioning Plan Document
11. EC Electrical Contractor
12. GC General Contractor
13. FPT Functional Performance Testing
14. CM Construction Manager
15. MC Mechanical Contractor
16. OPM Owner's Project Manager
17. OPR Owner's Project Requirements
18. PFC Pre-Functional Checklists
19. TAB Test, Adjust and Balance Contractor

1.3 DEFINITIONS

A. Acceptance Phase: This is the phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented; and when most of the Functional

Performance Testing, O&M documentation review and formal training occurs. This will generally occur after the Construction Phase is complete (startup and checks have been accomplished).

B. Action Item (AI): Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item. Action Items must be categorized as appropriate.

C. Approval/Acceptance: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

D. Architect/Engineer (A/E): The prime consultant (Architect and/or Engineer) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

E. Basis of Design (BOD) Document: The basis of design, also known as the design narrative. A document that records the concepts, calculations, decisions, and product selections used to meet the OPR and satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

F. Building Automation System (BAS): The computer-based control or automation system.

G. Commissioning Authority/Agent (CxA): The entity identified by the Owner who leads, plans, schedules, and coordinates the Cx team to implement the Cx process.

H. Commissioning Issues Log: A log created and updated by the CxA to track and maintain the updates of issues found during the Commissioning Process.

I. Commissioning Plan (Cx Plan): A document developed by the CxA that outlines the organization, schedule, allocation of resources, documentation requirements, etc. of the commissioning process.

J. Commissioning Process: A quality-focused process for enhancing the delivery of a project. This process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the OPR.

K. Contractor: As used herein, ‘Contractor’ is a general reference to the installing Party and can therefore refer to the Prime/Construction Manager (CM) or General Contractor (GC), subcontractors (Controls Contractor (CC), Electrical Contractor (EC), Mechanical Contractor (MC), Plumbing Contractor (PC), Fire Protection Contractor (FP), Fire Alarm Contractor (FA)), or vendors as inferred by its usage.

L. Construction Phase: Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete the installation, complete startup documentation, submit O&M information, establish trends, and perform any other applicable requirements to get systems started. Contractor and Vendors may also conduct equipment specific training. The Construction Phase will generally end upon completed startup and TAB of systems and equipment.

M. Contract Documents: The documents governing the responsibilities and relationships between Parties involved in the design and construction of this project including (but not necessarily limited to):

1. Agreements/Contracts
2. Construction Plans and Drawings
3. Specifications
4. Addenda and Bulletins
5. Change Orders

N. Data Logging: The monitoring and recording of flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control systems

O. Deferred Functional Tests: Functional tests that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

P. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Q. Energy Management Information System (EMIS): A broad family of tools and services to manage commercial building energy use. These technologies include, for example, the energy information system, equipment-specific fault detection and diagnostic systems, benchmarking and utility tracking tools, automated system optimization tools, and building automation systems.

R. Factory Authorized Representative: An individual fully trained on the equipment and certified by the manufacturer to perform the respective task.

S. Factory Testing: Testing of equipment on-site or at the factory, by factory personnel with an Owner's representative present.

T. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FPT's are performed after pre-functional checklists and startup is completed.

U. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

V. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

W. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

X. Non-Compliance: See Deficiency.

Y. Non-Conformance: See Deficiency.

Z. Non-Productive Time: Time spent by the CxA on-site for the purpose of witnessing procedures and/or testing (static pressure testing, hydronic flushing/purging procedures, functional performance tests, etc.) scheduled by the contractor, where progress is found to be incomplete thus preventing the procedure and/or testing from occurring and requiring the CxA to return to the project site at a later date to observe the same procedure. Non-productive time does not include time spent during FPT waiting for the contractor to correct minor issues such as sensor calibration, set-point adjustments, or other issues that arise during FPT that allow the procedure

and/or testing to continue with minor delays, nor does it include retesting a portion of the completed FPT to verify an issue was resolved.

AA. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50°F to 75°F to verify economizer operation). See also “Simulated Signal.”

BB. Owner/Owner’s Project Manager (OPM): Responsible individual representing the Owner in the overall construction project through whom all decisions and direction are made.

CC. Owner’s Project Requirements (OPR), also known as the Request for Proposal (RFP): A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

DD. Pre-functional Checklist (PFC): A form, provided by the CxA or installing contractor, used by the installing contractor to verify that appropriate components are on-site, correctly installed, started-up and ready for functional performance testing. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation.

EE. Sampling: Functional performance testing of a portion of the total number of identical or near identical pieces of equipment.

FF. Seasonal Performance Tests: FPTs that are deferred until the system(s) will experience conditions closer to their design conditions.

GG. Simulated Condition: Condition that is created for the purpose of testing the response of a system.

HH. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

II. Startup: Refers to the process whereby the Contractor verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the Startup Checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing, and completes the Startup Tests.

JJ. TAB: Can refer to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.

KK. Temporary Conditioning Plan: A plan that summarizes the logistics, procedures, and protocols for taking permanent equipment and using it to maintain conditions throughout construction. The Temporary Conditioning Plan must be approved by all members of the commissioning team prior to placing equipment into temporary service.

LL. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

MM. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents

NN. Trending: Monitoring using the building control system.

OO. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4 COORDINATION

A. Scheduling: The CxA will work with the CM/GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CM/GC for scheduling commissioning activities. The CM/GC will integrate all commissioning activities into the master

schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

B. The CxA will provide the initial schedule of primary commissioning events at the commissioning kick-off meeting. The Commissioning Plan - Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA to be incorporated into the Contractor's construction schedule.

1.5 SYSTEMS TO BE COMMISSIONED

A. Commissioning of equipment or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's Operation and Maintenance personnel, is required in cooperation with the Owner and the Commissioning Authority.

B. The Contractor is responsible for providing full commissioning of 100% of the systems and equipment included below as part of the Construction Phase of this project regardless of the sampling rate of the CxA.

C. Systems to be commissioned as part of this project include but are not limited to the list below. Quantities shown in parenthesis indicate an approximate sampling amount of each system/equipment type for which the Contractor is to include commissioning time in their bid to allow for the verification of functional performance testing results as directed by the CxA. The CxA shall refine this list and the sampling quantity in the final Cx Plan. If during verifications, it is determined that significant deficiencies in functional performance exist even after the contractor has indicated that systems meet the performance requirements, the CxA may expand the sampling quantity to a greater amount to verify the deficiencies of each piece of equipment. In the event this becomes necessary, the Contractor will be charged and will pay for the additional costs incurred by the CxA, A/E, and Owner to perform additional verification/witnessing.

1. Heating, ventilating and air conditioning (HVAC) systems and controls (1.5.1A.1A)
    a. VAV air handling unit (4 of 4)
    b. Dedicated outdoor air units (1 of 1)
    c. Energy recovery coils/systems (2 of 2)
    d. VAV terminal boxes (12 of 47)
    e. Laboratory supply/exhaust air valves (17 supply valves and 13 exhaust valves)
    f. Laboratory exhaust fans (4 of 4)
    g. General Exhaust fans (2 of 2)
    h. Ductless split system AC units (9 of 9)
    i. Hot water unit heater (1 of 1)
    j. Building automation system (control and interface associated with commissioned systems)
2. Building envelope (1.5.1A.1B)
    a. Exterior windows and doors – air leakage
    b. Exterior windows, skylights, doors, and curtain walls – water penetration
    c. Storefronts, curtain walls, and sloped glazing systems – water leakage
    d. Roofing systems – infrared imaging
3. Lighting systems and controls (1.5.1A.1C)
    a. Room lighting controls including occupancy
    b. Daylighting sensors and wall switches

4. Plumbing (1.5.1A.1D)
    a. Electric water heater (1 of 1)
    b. Plate and frame heat exchanger (1 of 1)
    c. Recirculation pump
5. Electrical systems including all renewable electrical generation (1.5.1A.1F)
    a. Metering and submetering
    b. Emergency power and automatic transfer equipment
    c. Electrical Power Distribution Systems (including panel and switchboard arc-testing and lightning protection impedance testing by others – 25% sample)
    d. Lighting Controls (Occupancy and daylighting – 25% sample)
    e. Fire alarm systems
        1) Interface with HVAC systems
        2) Elevator recall and shutdown
        3) Fire suppression/protection systems (limited to fire pump testing by others)
        4) Smoke Pressurization fans, interface with other life safety systems including fire alarm, security systems and building pressurization interface.
    f. Fire and smoke dampers installation and operation (25% sample)
    g. Security system

1.6 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):
    1. Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the CM/GC and representatives of the Contractor, including Project superintendent and sub-contractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:
    1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
    2. Representatives of the facility user and operation and maintenance personnel.
    3. The Owners Representative.
    4. Engineering design professionals.

1.7 RESPONSIBILITIES

A. Refer to the attached Cx Plan for the roles and responsibilities for each party in the commissioning process. The responsibilities of the building enclosure contractor are in Division 01, the plumbing contractor are in Division 22, the mechanical contractor, TAB, and controls contractor are in Division 23 and those of the electrical contractor in Division 26. For testing of systems requiring the support of equipment suppliers and vendors, responsibilities are as follows:

B. Equipment Supplier/Vendor Responsibilities
    1. Construction Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier during the Construction Phase.
        a. Provide shop drawings and product data in hard copy and electronic format.

b. Provide manufacturer's application, installation and startup instructions within 30 days of shop drawing/product data approval.

c. Where factory-authorized startup is specified, coordinate and participate in the specified commissioning process and document startup on the appropriate forms.

d. Review and approve Functional Test Procedures affecting supplied equipment.

e. Where training is to be provided by factory-authorized personnel, provide required training plan information including course content for approval by A/E and review and comment by CxA prior to conducting the training.

f. Conduct and document Equipment and Systems Training events as required by this section and by applicable sections of the specifications pertaining to each piece of equipment or system.

g. Provide spare parts and materials as required by specifications.

h. Provide special tools as required by the specifications.

i. Provide content as required and develop project-specific O&M content as required by the Commissioning requirements.

j. Provide all specified warranties.

2. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier during the Acceptance Phase.

a. Participate in any Functional Performance Testing and Demonstrations required.

b. Consult on issues identified relative to the supplied equipment.

3. Warranty Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier during the Warranty Phase.

a. Provide any warranty service required to the supplied equipment as applicable with the agreement with the Contractor.

b. Provide technical support to the Owner's facilities personnel.

1.8 WEB-BASED COMMISSIONING PORTAL

A. All general and major contractors participating in the Cx process shall use the web-based Cx Portal, CxAlloy ("Portal" or "CxAlloy") to document the Cx procedures. The Portal is a Web-based Internet hub used to electronically collaborate and coordinate activities and deliverables throughout the Cx process. The Portal is hosted by the CxA and shall be accessible to all Parties participating in the Cx program. The Portal provides a common location to store Pre-Functional Checklists, Startup Documentation, Functional Performance Tests (FPTs) and results, Issues Log tracking, project documents and deliverables. It also serves as a collaborative e-mail hub to facilitate, automate, and track communications between Parties relating to the Cx process.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial pre-functional checkout and required functional performance testing shall be provided by the installing contractor for the equipment being tested. All testing equipment used in the commissioning process shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be

included in the base bid price to the Contractor and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Data logging equipment and software required to test equipment will be provided by the CxA but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available. If not otherwise noted, the following minimum requirements apply:

1. All test instruments shall have had a certification within the last 12 months.
2. Pressure testing equipment and digital thermometers shall have a certified calibration within the past year to an accuracy double that of the instrument being tested/calibrated.

E. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

PART 3 EXECUTION

3.1 MEETINGS (Contractors shall include time in their base bid for CxA meetings)

A. Cx Kick-off Meeting: The CxA will schedule, plan, and conduct a commissioning kick-off meeting with the project commissioning team. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise their preliminary Commissioning Plan to its "final" version, which will also be distributed to all parties. The following will be discussed at this meeting:

1. The Commissioning Documents.
2. Requirements of Commissioning.
3. Responsibilities of the construction parties.
4. Management protocols.
5. Submittals.
6. Schedule.

B. Miscellaneous Meetings: Up to ten (10) additional meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with the CM/GC and affected subcontractors. The CxA will plan these meetings and will minimize unnecessary time being spent by Subcontractors. These meetings will be held as necessary throughout the construction period.

3.2 FIELD OBSERVATIONS

A. The CxA will provide commissioning field observation reports with commissioning issues logs of non-conformance issues with increasing frequency as construction and commissioning progresses. All field observation reports and issues logs will be communicated through the web-based commissioning portal (CxAlloy).

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through emails, progress reports, etc.

3.3 REPORTING

A. The CxA will provide commissioning site observation reports with commissioning issues logs of non-conformance items, to the OPM and copy the CM/GC, with increasing frequency as construction and commissioning progresses.

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review comments and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

3.4 SUBMITTALS AND DOCUMENTATION

A. Contractor shall provide to the Commissioning Authority the following per the procedures specified herein and in other Sections of the specification:

1. Shop Drawings and Product Data: Information related to systems or equipment to be commissioned. Commissioning Authority shall review and incorporate comments via the Design Engineer. Documentation shall include spare parts lists.
2. Draft Startup Procedures: Contractor shall develop Startup Procedures for all applicable equipment and systems along with the manufacturer's application, installation and startup procedures. CxA may initially provide to the Contractor generic Startup Checklists, the content of which must be reviewed by the Contractor and supplemented with manufacturer-specific requirements and the Contractor's own internal quality assurance procedures and checks. CxA will review drafts and provide comments.
3. Factory Test Reports: Contractor shall provide any factory testing documentation or certified test reports required by the specifications. These shall be provided prior to Acceptance Phase.
4. Schedule Updates: Issue periodic updates to the construction schedule. Provide to the CxA at least once per month before building is closed in and every two weeks thereafter. Contractor shall use schedule to notify commissioning team of scheduled startup and training activities.
5. Action Item/Commissioning Issue Response: Responses to Action Items/Issues Log Items to which commissioning team members assign the Contractor responsibility. Issues and responses shall be tracked through MBPs web-based commissioning portal, CxAlloy.
6. Field Testing Agency Reports. Provide all documentation of work of independent testing agencies required by the specification. These shall be provided prior to Acceptance Phase.
7. Completed Startup Procedures: Completed Startup Procedure documentation for all applicable equipment and systems. CxA will review prior to functional performance testing.
8. Completed and approved TAB report(s) for all equipment and systems. CxA will review and schedule a TAB verification visit prior to any functional performance testing.
9. Nameplate Data Documentation: Provide prior to the start of the Acceptance Phase.
10. Equipment Warranty's: Provide prior to the start of the Acceptance Phase.
11. Training Plan: Provide prior to the start of the Acceptance Phase.
12. Record Training Documentation: Provide at least 7 days prior to the start of the applicable training.
13. Provide O&M Documentation content per the requirements of this section, and Division 1 requirements. Submit at least one month prior to the beginning of the Acceptance Phase.

B. The CxA will provide appropriate contractors with a specific request for additional submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. The request will include, at a minimum, the manufacturer and model number, the manufacturer's printed

installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings, spare parts lists, preventive maintenance schedules and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA will be included by the sub-contractors in their O&M manual documentation.

C. The CxA will review and provide comment on submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the CM/GC or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resolution.

D. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the specifications.

E. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review and comment on them.

F. Record Drawings: Contractor shall maintain at the site an updated set of record documents reflecting actual installed conditions and all approved changes and modifications to the Contract Documents. Contractor shall provide access to the CxA to review the Record Drawings. Provide Record Drawings in accordance with Division 01.

3.5 CALIBRATIONS

A. Sensor and Actuator Calibration:

1. All field-installed temperature, relative humidity, CO, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be field calibrated. Verify that all locations are appropriate and away from causes of erratic operation (i.e., unstable flow conditions, other heat sources, vibration, etc.).

2. Verify that the sensor reading (via the permanent thermostat, gage or BAS) is within the tolerances defined in the controls specification section of the instrument-measured value over the full range of expected control. If not, install offset in the BAS, calibrate or replace sensor.

B. Valve and Damper Stroke Check

1. BAS Readout: For all valve and damper actuator positions checked, including fully open or closed and intermediate positions, verify the actual position against the BAS readout. Verify fail-safe operation. If actual valve or damper position doesn’t reasonably correspond after adjustments, replace actuator.

3.6 PRE-FUNCTIONAL CHECKLISTS, STARTUP AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Part 1.5 - “Systems to be Commissioned” from above, and any additional systems or equipment identified by the CxA. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical systems, may have very simplified PFCs and startup.

B. Pre-functional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout by the installing contractor(s). The CxA will perform random sampling strategies to

verify proper completion of the PFCs. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Four weeks prior to startup, the CM/GC shall schedule installing contractors and vendors for equipment startup and checkout and coordinate with the CxA. The performance of the pre-functional checklists, startup and checkout are directed and executed by the installing contractors or vendors.

D. The CxA may observe the procedures for each piece of primary equipment, unless there are multiple units (in which case a sampling strategy may be used).

E. For lower-level components of equipment (e.g., fan-coil units, sensors, controllers), the CxA may observe a sampling of the pre-functional and startup procedures.

F. The installing contractors and vendors shall execute startup and provide the CxA with the completed startup and pre-functional tests and checklists.

G. Only individuals that have witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.

H. Clearly list any outstanding items of the initial startup and pre-functional procedures that were not completed successfully. The procedures form and any outstanding deficiencies are provided to the CxA within a week of test completion.

I. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner. The CM/GC shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated startup report and a Statement of Correction on the original non-compliance report.

J. Deficient items identified during pre-functional testing and initial startup not corrected, which later cause deficiencies or delays during functional performance testing, will result in back charges to the CM/GC for the CxA's time to perform any retesting. The installing contractor shall be responsible for performing retests of deficient pre-functional or functional tests at its own cost.

3.7 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. Development of Test Procedures: Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, control sequences and parameters. Using the testing parameters and requirements in Divisions 22, 23, and 26 the CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each subcontractor or vendor responsible to execute a test, shall provide assistance to the CxA in developing the procedures and review. Prior to execution, the CxA shall provide a copy of the test procedures to the Subcontractors who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA will submit the tests to the A/E for review.

1. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the specifications. Redundancy of testing shall be minimized.

2. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

C. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and

analyzing the results using the control system's trend log capabilities or by stand-alone data loggers.

D. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

E. Overwriting sensor values to simulate a condition, such as overwriting the outside air, shall be permitted. Simulating a condition is preferable. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

F. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.

G. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable.

H. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses.

I. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The installing contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the installing contractor shall return all affected building equipment and systems to their pre-test condition.

J. The CM/GC shall provide a minimum of two weeks' notice to the CxA regarding its completion schedule for the pre-functional checklists and startup of all equipment and systems. The CxA will schedule functional performance tests through the CM/GC. The CxA shall coordinate, witness, and document the functional testing of all equipment and systems. The installing contractors shall execute the tests.

K. Functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the Engineer, Owner and CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing (TAB) is completed, debugged, approved and TAB verification has been performed before functional testing of air-related or water-related equipment or systems.

L. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractors and A/E.

M. Items identified as deficient during pre-functional testing and initial startup, but not corrected, that later cause deficiencies or delays during functional performance testing, will result in back charges to the CM/GC for the CxA's time to perform any retesting. The installing contractor shall be responsible for performing retests of deficient pre-functional testing and functional tests at its own cost.

3.8 SAMPLING AND FAILURE

A. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference.

B. Sampling by contractors is not permitted during pre-functional checklist execution unless otherwise permitted by the CxA or Owner.

C. For sampling rates for TAB verification and functional performance testing refer to “Systems to be Commissioned” Section 1.5 above, the Cx Plan and individual Divisions 22, 23, and 26

D. A common sampling strategy is the “xx% Sampling-yy% Failure Rule” where “xx = the percent of the group of identical equipment to be included in each sample” and “yy = the percent of the sample that if failing, will require another sample to be tested.

E. For this project, the Failure Rule will be 10% or a minimum of two, whichever is greater.

F. An example of the “xx% Sampling-yy% Failure Rule” describing a 30% Sampling-10% Failure Rule:

1. Randomly test at least 30% (xx) of each group of identical equipment. In no case test less than three units in each group. This 30%, or three, constitute the “first sample.”
2. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 30% of the group (the second sample).
3. If 10% of the units in the second sample fail, test all remaining units in the whole group.
4. Any additional testing required beyond the first sample will be treated as a failure and the cost of the additional testing will be the responsibility of the Contractor as described in section 3.11.
5. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the installing contractor to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

3.9 DOCUMENTATION, NON-CONFORMANCE, AND ACCEPTANCE OF TESTS

A. Documentation: The CxA shall witness and document the results of selected quantities of functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM/GC and the subcontractors for their review and use. The CxA will include the filled-out forms in the final commissioning report and in the O&M manuals.

B. Non-Conformance:

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM/GC, Owner, and A/E by through the commissioning issues log on MBPs cloud-based commissioning portal, CxAlloy, and through commissioning observation reports.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the OPM.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
    a. When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
        1) The CxA documents the deficiency and the Contractor’s response and intentions, and they go on to another test or sequence. After the day’s work, the CxA reports

the in the Commissioning Issues Log to the CM/GC, Subcontractor, Owner, and A/E. The Contractor corrects the deficiency, provides a report of corrective action taken certifying that the equipment is ready to be retested and sends it back to the CxA.

2) The CxA reschedules the test, and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented in the Commissioning Issues Log with the Contractor's response and a copy given to the Owner, A/E, CM/GC and the Subcontractor representative assumed to be responsible.

2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the CxA, A/E and OPM. Final acceptance authority is with the OPM and A/E.

3) The CxA documents the resolution process.

4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, provides a report of corrective action taken certifying that the equipment is ready to be retested and sends it back to the CxA. The CxA reschedules the test, and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting: Refer to Section 3.9for details regarding costs/penalties for retesting.

6. The Contractor shall respond in writing to the CxA and OPM at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. The CxA retains the original non-conformance report/form until the end of the project.

8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect: If 10%, or a minimum of three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the OPM. In such case, the Contractor shall provide the Owner with the following:

1. Within one week of notification from the OPM, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E, CxA and OPM within two weeks of the original notice.

2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

3. The OPM will determine whether a replacement of all identical units or a repair is acceptable.

4. Two examples of the proposed solution will be installed by the Contractor and the OPM will be allowed to test the installations for up to one week, upon which the OPM will decide whether to accept the solution.

5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Acceptance: The CxA notes each satisfactorily demonstrated function on the test form. Formal acceptance of the functional test is made after review by the CxA, A/E and OPM, if necessary.

The CxA recommends acceptance of each test to the OPM using the standard forms. The OPM gives final acceptance on each test using the same form, providing a signed copy to the CxA and the Contractor.

3.10 PENALTIES FOR RETESTING SYSTEMS OR EQUIPMENT

A. The cost for the Contractor to retest a pre-functional or functional test shall be theirs.

B. For deficiencies identified, not related to any pre-functional checklist of startup fault, the following shall apply: The CxA will advise the OPM and A/E of the issue(s), who will then review and direct the CM/GC and their subcontractors as to corrective action to take and retesting of the equipment (including TAB verification). The cost for the CxA to perform one retest up to a total of 8 hours (including travel time and expenses) will be performed at no “charge” to the CM/GC for their time. However, the CxA’s time for a second retest/verification or testing totaling over 8 hours (including travel time and expenses) will be submitted as a change order to the Owner, who will assess the additional cost for the CxA against the CM/GC contract amount, and the CM/GC may choose to recover costs from the responsible subcontractor.

C. The time for the CxA to oversee and coordinate any retesting required because a specific pre-functional checklist or startup test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be submitted as a change order to the Owner, who will assess the additional cost for the CxA against the CM/GC contract amount, and the CM/GC may choose to recover costs from the responsible subcontractor.

3.11 OPERATION AND MAINTENANCE MANUALS

A. CxA Review and Comment: Provide the CxA an electronic copy of the O&M manuals and redline as-builts for systems that were commissioned, and other system documentation as determined by the CxA. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builts to verify compliance with the specifications. The CxA will communicate deficiencies in the manuals to the CM/GC, OPM and A/E, as required. The OPM or A/E shall direct the CM/GC and/or subcontractor to correct the deficiency as necessary and resubmit. Upon a successful review of the corrections, the CxA recommends acceptance of these sections of the O&M manuals to the OPM and A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E’s review of the O&M manuals according to the A/E’s contract.

3.12 TRAINING OF OWNER PERSONNEL

A. Training shall be in accordance with ASHRAE Standard 202-2018, *Commissioning Process for Buildings and Systems*, and ASHRAE Guideline 0-2019, *The Commissioning Process*.

B. The CM/GC shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

C. The CxA shall be responsible for overseeing and commenting on the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CM/GC shall interview the facility/maintenance manager to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the requirements to the CM/GC, subcontractors, and vendors who have training responsibilities. In addition to these general requirements, the specific training requirements of Owner personnel by Contractors and vendors is specified in Division 22, 23, 26, 27 and 28.

2. Each subcontractor and vendor responsible for training will submit a written training plan to the CxA, A/E and OPM for review and comment prior to training. The plan will cover the following elements:

a. Equipment (included in training)
b. Sign-in sheet.
c. Intended audience.
d. Location of training
e. Training Objectives.
f. Subjects covered (description, duration of discussion, special methods, etc).
g. Duration of training on each subject.
h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
i. Instructor qualifications.
j. For the primary HVAC equipment, the Controls Contractor shall provide a discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3. The CxA shall review and provide comments regarding the contractors overall training plan. The CM/GC shall coordinate and schedule the training for the commissioned systems with the Owner and CxA. The CxA and Owner develops criteria for determining that the training was satisfactorily completed. The CxA recommends acceptance of the training to the Owner if they feel the training meets the Contract Document requirements.
4. A sign-in sheet of attendees shall be submitted to the CxA for proof of training.
5. The mechanical design engineer shall be at the first training session and present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings) including cooling systems, heating systems, supply air systems, exhaust air systems and outside air strategies.
6. The electrical design engineer shall be at the first training session and present the overall system design concept and the design concept of each piece of commissioned equipment. This presentation shall include a review of all systems using simplified system schematics (one-line drawings) including the switchgear, panel boards, transformers, safety switches, emergency generator and lighting control system.
7. Video recording of the training sessions shall be in accordance with the Contract Documents, and shall be provided by the CM/GC, with training sessions properly cataloged and stored on an approved electronic media.

3.13 DEFERRED TESTING

A. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon Owner approval. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be required.

B. Seasonal Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system’s design) specified in Division 23 shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subcontractors, with facilities staff and the CxA

witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.14 SAMPLE PRE-FUNCTIONAL CHECKLISTS

A. See Commissioning Plan Appendix A

3.15 SAMPLE FUNCTIONAL PERFORMANCE TESTS

A. See Commissioning Plan Appendix B

END OF SECTION 019113

SECTION 01 91 25 - BUILDING ENCLOSURE COMMISSIONING

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 019113 "General Commissioning Requirements" for general Cx process requirements and BECxA responsibilities.

C. Division 03, Division 04, Division 06, Division 07 through 14 Sections for facility exterior enclosure commissioning requirements specific to the Work of each Section.

1.2 SUMMARY

A. This project shall include Building Enclosure Commissioning (BECx) as part of the design and construction processes. The primary intent of the BECx is to provide a process for independent, third-party verification that the installed performance of the building enclosure meets or exceeds the minimum performance requirements set forth by the Contract Documents. Materials, components, systems and assemblies that comprise the above and below-grade building exterior enclosure shall be evaluated and tested as outlined in this Section.

B. The exterior enclosure typically includes floor, walls, fenestrations, and roof assemblies that separate interior and exterior environments. Performance requirements have been established for materials and assemblies that comprise the building enclosure, related to the following physical properties:

1. Air leakage.
2. Condensation resistance.
3. Thermal performance.
4. Water vapor permeance.
5. Resistance to water penetration.
6. Durability.

C. Typical materials and assemblies that will be evaluated as part of the BECx process for this project include:

1. Foundation walls and slab-on-grade foundation components.

    a. Below-slab vapor barrier.
    b. Below-grade waterproofing and damp proofing.
    c. Perimeter drainage.

2. Exterior wall components.

    a. Exterior sheathing.
    b. Thermal insulation.
    c. Air/Weather resistive barrier.
    d. Vapor retarder.
    e. Cladding elements.
    f. Windows, curtain walls, storefronts, doors and louvers.
    g. Coatings.

h. Sealants.

3. Roof components.

a. Roof deck.
b. Thermal insulation.
c. Low-slope roof membrane.
d. Integration of roof materials with surrounding walls.

4. Interface conditions (integral flashing, expansion joints, etc.) between materials, components and systems that comprise the above-grade and below-grade building exterior enclosure.

1.3 REFERENCED STANDARDS

A. ASTM E2813-12, Standard Practice for Building Enclosure Commissioning.

1.4 DEFINITIONS AND ABBREVIATIONS

A. Building Enclosure: All materials, components, systems and assemblies intended to provide shelter and environmental separation between the interior and exterior, or between two or more environmentally distinct interior spaces in a building or structure.

B. Building Enclosure Commissioning (BECx): A process that begins with the establishment of the Owner's Project Requirements (OPR) and endeavors to ensure that the exterior enclosure and those elements intended to provide environmental separation within a building or structure to meet or exceed the expectations of the Owner as defined in the OPR.

C. Building Enclosure Commissioning Agent (BECxA): The individual or firm retained by the Owner that develops, manages, and is responsible for the BECx process.

D. Building Enclosure Commissioning Plan (BECxP): Project-specific protocol developed by the BECxA, which outlines the BECx process for all related components and assemblies. This document shall identify the Commissioning Team and a general schedule of all tasks involved in the BECx process, including design reviews, construction observations, mockup construction and testing, and technical reports that shall be produced over the course of the Project.

E. Building Enclosure Commissioning Closeout Report: Final deliverable from the BECx process. Includes a full summary report with appropriate documentation including the following information: a narrative including a list of enclosure systems and components included as part of the BECx, a description of non-conforming conditions noted during site observations with follow-up documentation on the means and methods to resolve and summary results of building performance testing.

F. Building Enclosure Commissioning Team: Owner, Contractor, Architect and Building Enclosure Commissioning Agent.

G. Contract Documents: Documents governing the responsibilities and relationships between Parties involved in the design and construction of this project, including, but not limited to agreements/contracts, drawings and specifications, addenda, change orders and the BECx Plan.

H. Construction Documents: Refers to the Contract Documents that dictate the details of construction.

I. Contractor: As used herein, “Contractor” is a general reference to the installing Party and can therefore refer to the General Contractor, Project Manager, subcontractors or vendors as inferred by its usage.

J. Owner’s Project Requirements (OPR): A written document that includes the programmatic, aesthetic and function performance requirements of a building or structure and the expectations of the Owner relative to its intended use, occupancy, operation and service life.

1.5 BECxA SCOPE OF SERVICES

A. Owner shall engage a qualified BECxA to perform all building enclosure-related consulting services, including design reviews, collaborative meetings, quality assurance observations and field testing, unless specified otherwise.

B. BECxP Development:

1. Prior to the Pre-Design phase of the project, provide technical assistance in developing the preliminary OPR and develop a project specific Building Envelope Commissioning Plan (BECxP) that outlines the BECx process for all related components and assemblies. BECxP shall identify the Commissioning Team and include a comprehensive checklist and general schedule of tasks involved in the BECx, with responsibilities assigned, including planning meetings, design reviews, construction observations, mockup construction and testing, in-situ testing and technical reports produced over the course of the Project.

C. Design Reviews:

1. Perform three, independent, third-party reviews of enclosure-related construction document drawings and specifications. Provide a written report.

D. Review and comment on submittals from the Contractor for compliance with the building enclosure requirements set forth in the Contract Documents. This review shall be conducted concurrently with the design team review. Note that the BECxA shall not have the authority to accept or reject submittals.

E. Attend a pre-construction commissioning conference prior to the start of construction of the building enclosure, coordinated with the Owner, Contractor and Architect. The BECxA shall attend this meeting to review commissioning responsibilities and personnel assignments.

1. Attendees: Authorized representatives of the Owner, all Contractors whose work is relevant to the building enclosure, Architect and other related parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to commissioning.
2. Agenda: Discuss items of significance that could affect progress included the following:

a. Building Enclosure Commissioning Plan and related specifications.
b. Tentative construction schedule per Contractor.
c. Phasing.
d. Critical work sequencing.
e. Designation of key personnel and their duties.
f. Mockup construction and testing.
g. Procedures for QA/AC, testing and construction monitoring.
h. Submittal procedures.
i. LEED/Green Globe requirements.
j. Preparation of record documents.

k. Process for correcting non-compliant work.
l. Maintenance requirements to maintain enclosure.

F. Observe construction of building enclosure work and report progress and deficiencies. Provide a report of each site visit, including any non-compliant work observed, to Owner Contractor Architect. Include recommendations for proposed solutions of conditions noted. Quantity of site visits to be determined as part of the development of the BECxP.

G. Participate in periodic meetings to review and discuss issues and concerns related to the building enclosure noted by the Architect, the CxA, BECxA and the Owner.

H. Perform mock-up field testing of exterior building enclosure components and assemblies, as required by the Contract Documents. Document construction of testing components at the completion of mock-up testing and provide technical reports with this information to Owner Contractor Architect.

I. Perform field tests of exterior building enclosure components and assemblies, as required by the Contract Documents. Document construction of components at the completion of field testing and provide technical reports with this information to Owner Contractor Architect.

J. Provide a BECx Closeout Report to Owner, Contractor, Architect. This report includes the following items at a minimum, as related to the building enclosure:

1. Summary outline identifying unresolved/undocumented non-conforming work.
2. Paper or electronic copies of all documentation and correspondence prepared by the BECxA.
3. Guidelines for routine evaluation and maintenance.

K. Building Enclosure Commissioning Agent is not authorized to:

1. Release, revoke, alter or expand requirements of the Contract Documents.
2. Approve or accept any portion of the work.
3. Revise construction drawings and specifications.
4. Perform any duties of the Contractor.

1.6 CONTRACTOR RESPONSIBLITIES

A. Furnish copies of all submittals, shop drawings, manufacturers' literature, installation instructions, maintenance information, schedules, warranties or other information as requested. Note that it is the Architect and Contractor's responsibility to approve or reject submittals and shop drawings.

B. Provide access to work, including scissor/boom lifts and/or scaffolding, provide power/water as required for testing, and coordinate scheduling with the BECxA to perform BECx tasks.

C. Provide qualified personnel for assistance in completing the commissioning tests for elements of the building envelope.

D. Submit a copy of the General Contractor's project and site specific Quality Assurance program to be implemented for construction for review prior to beginning of construction.

E. Ensure all subcontractors utilized for work on the building enclosure participate in the Preconstruction Meeting with the design and construction teams, Owner's representatives, CxA and BECxA.

F. Construction of on-site mock-ups including elements of the building exterior enclosure, as identified in the Contract Documents.

G. Provide personnel and have a representative present from each trade and/or subcontractor associated with installing the systems during mock-up and/or in-situ performance testing. Personnel completing work in the field are to be utilized to participate in the construction of on-site mockups of building enclosure assemblies as required by the Construction Documents, and to have a representative present during inspection and testing of mockups. If deficiencies are observed within the mockup, provide labor and materials to repair or reconstruct the mockup such that deficiencies do not exist and mockup passes field testing.

H. Participate in periodic BECx meetings with representatives present from each trade and/or subcontractor to review and discuss issues and concerns related to the building envelope noted by the Architect, CxA, BECxA and the Owner and actions that shall be taken to address the noted non-conformances. Maintain a summary of non-conformances and current status.

I. Provide the following information to the BECxA for inclusion in the BECxP:

1. Submittals, information for systems manuals and other required documents and reports.
2. Identification of installed exterior enclosure components, assemblies, systems and equipment, including design changes that occurred during the construction phase.
3. Certificate of completion, certifying that exterior enclosure assemblies, systems, equipment and associated controls are complete and ready for testing.
4. Test and inspection reports and certificates.
5. Corrective action documents.

J. Reimburse Owner for additional testing and construction monitoring performed by the BECxA if building enclosure systems and mockups are not constructed per Construction Documents.

1.7 ARCHITECT RESPONSIBILITIES

A. Provide electronic copies of project drawings and specifications to the BECxA.

1. Clearly illustrate a continuous air barrier boundary on plan and section sheets, as required. Boundary to include integrated floor/slab, walls and roof/ceiling assemblies.
2. Clearly define air and water barrier materials and assemblies for each component on drawings and in related specifications.
3. Provide details illustrating integration of air and water barrier materials at all transitions (e.g. roof to wall, wall to floor, building expansion joints, exterior doors and windows, etc.).

B. Provide written responses to design review comments from the BECxA or other parties as requested.

C. Attend pre-construction commissioning conference.

D. Coordinate resolution of system deficiencies identified during BECx according to contract documents.

PART 3 EXECUTION

3.1 VERIFICATION

A. Certify that building exterior systems, subsystems and construction have been completed according to the Contract Documents.

3.2 SYSTEMS TO BE COMMISSIONED

A. Refer to the Related Documents and Sections identified for specific requirements. The systems and elements to be commissioned include:

1. Roof systems (including penetrations, curbs, etc.).
2. Exterior wall systems (all types).
3. Windows.
4. Doors.
5. Louvers.
6. Sealants.
7. Building expansion joint accessories (roof and wall).
8. Flashings.
9. Curtain walls/window walls, storefronts and louvers.
10. Below-grade damp proofing.
11. Below-grade waterproofing.
12. Floors (slab-on-grade, crawlspace, etc.).
13. Any other special building enclosure system, equipment and controls.

3.3 EXTERIOR ENVELOPE SYSTEM TESTING

A. Test methods listed below are included as reference to ASTM E 2813, Annex 2. If components or assemblies do not pass initial testing, Contractor shall provide labor and materials to repair mockup or in-situ locations until a successful test is accomplished.

B. Refer to ASTM E2813, Annex A2, for number and location (mockup and/or in situ) of required tests.

C. Performance Testing to be performed and reported by BECxA:

1. Air leakage:

a. ASTM E783, *Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors*. Test areas are assumed to be approximately 10’x10’ in size and will be conducted on three (3) separate occasions.

2. Water penetration:

a. ASTM E1105, *Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference*. Three (3) tests to be performed in conjunction with ASTM E783.

b. AAMA 501.2, *Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems*. Test areas are assumed to be approximately 5'x5' in size and will be conducted on four (4) separate occasions.
c. ASTM C1153, *Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging*. Observation of openings at observed anomalies to be performed as an additional construction site visit. Roof openings to be made and repaired by installing contractor.

3. Wall Cavity water/air penetration:

   a. *ASTM C1060-11a-Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings*. A report indicating locations of observed anomalies, including the thermal images, shall be provided.

4. ASTM C1193, Appendix X1-Method A, Guide for Use of Joint Sealants: Field- Applied Sealant Joint Hand Pull Tab.

5. Verify that field quality-control testing of building exterior enclosure has been completed and approved, that discrepancies have been corrected and corrective work approved.

END OF SECTION

SECTION 02 41 13 – SELECTIVE SITE REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. This section covers the labor and materials necessary for the Work associated with the demolition of existing speed tables, concrete sidewalks, asphalt paving, and curb and gutter, etc. on the Drawings and specified herein while maintaining continuous operation of the Owner's facilities.
2. The information contained on Drawings showing demolition is based on the available record drawings and information from previous construction projects within the project area. The supplementary information and reference drawings are provided solely for the convenience of the Contractor. Neither the Engineer nor the Owner assumes any responsibility for the accuracy or completeness of these drawings or for the Contractor's interpretation of this supplementary information. The Contractor shall perform all demolition required regardless of type or amount. The Contractor shall inspect the facilities to be demolished as specified in Specifications, to satisfy itself as to the nature and location of the Work. Differences between the Contract Documents and the actual facilities shall not constitute grounds for time extension or contract modifications.
3. Any utility to be relocated in order to facilitate construction should first be coordinated with the Owner and/or owning utility company before the utility is to be interrupted.

1.2 GENERAL

A. Some obstructions may not be shown. This Contract shall include, as incidental to the Work, removal and replacement of obstructions such as water lines, electric lines, and similar items deemed by the Engineer to be required to meet the design intent shown in these Contract Documents, even though not shown or specifically mentioned.

1.3 DEFINITIONS

A. Remove: Demolish complete as specified herein including offsite disposal except for those specific portions of removed items specified to be salvaged.

B. Salvage: Detach and turn over to Owner removed portions of the Work in good working condition or credit the owner the price of the material or item.

C. Standard Specifications: When referenced in this section, shall mean North Carolina Department of Transportation Standard Specifications For Roads And Structures, January 2018. Parts of these Standard Specifications that are specifically referenced shall become part of this section as though stated herein in full. In case of a discrepancy between the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 SUBMITTALS

A. Submittals shall be made in accordance with the Division 01 Section "Submittal Procedures". In addition, the following specific information shall apply:

1. The Contractor shall submit to the Engineer for approval, schedules of demolition, including:
   a. Detailed methods and phasing of demolition to be used within the project area including any interruption of existing utility services or access.
   b. Copies of authorization, and permits, including any excavation permits, to remove the existing utility infrastructure as indicated on the Drawings.

c. Inventory of items to be removed and salvaged.
d. Pre-demolition photographs showing the existing conditions of adjoining construction and site improvements that might be misconstrued as damage cause by demolition operations.
e. Temporary protection measures

2. The Contractor shall make all alterations in the schedule or methods required by the Engineer at the Contractor's sole expense.
3. No demolition activities shall commence until schedules for demolition have been approved by the Engineer for the affected areas or activities.

1.6 COORDINATION

A. Prior to beginning demolition work, clearly field-identify all items that are scheduled to be demolished and salvaged.

B. Conduct a walk-through with the Owner to:
1. Verify and agree to the items identified for demolition and salvage.
2. Identify and resolve problems with the existing utility infrastructure that will be a result of the demolition Work.

C. Do not interrupt any service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Owner's Representative no fewer than (72) hours in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's Representative's written permission.

PART 2 PRODUCTS - Not applicable to this Section

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall set up construction facilities in a neat and orderly manner in accordance with Specifications. Contractor shall accomplish all Work in accordance with the applicable portions of these Specifications and as approved. All operations shall be confined to the Work area.

3.2 PERFORMANCE REQUIREMENTS

A. All Work shall be performed in conformance with local, State, and federal rules and regulations pertaining to safety and as specified elsewhere in these Specifications.

B. Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Comply with ANSI A10.6 and NFPA 241.

D. Contractor shall obtain all necessary local, State, and federal permits (at no additional cost to the Owner) required for the demolition of the elements on site and complete all Work in conformance with local, State, and federal rules. In addition, contractor shall perform (at no additional cost to the Owner), any required inspections for lead, asbestos, or other hazardous materials prior to demolition and / or as part of obtaining any required demolition permits. The costs for disposing of these materials (if found) shall be part of the base bid.

3.3 DISPOSAL AND SALVAGE OF MATERIAL

A. Contractor shall remove and properly dispose of all rubble and material from the Site unless otherwise specified or shown on the Drawings. This shall include, but not be limited to, the following: concrete rubble, underdrain piping, storm drainage piping, unsuitable backfill material,

fences, brush, wood, and other debris. Contractor shall accomplish disposal offsite in accordance with local, State, and federal laws.

3.4 DEMOLITION ACTIVITIES AND PROTECTION

A. The Contractor shall be responsible for having all appropriate services located and turned off before demolition is started. The Contractor shall excavate all utility lines to be demolished and shall provide a permanent leak-proof closure for all abandoned water, gas lines, and electrical conduits. Closures shall be made with caps or plugs specifically designed for the applicable piping system.

B. Where abandoned utility lines are exposed by demolition excavation, they shall be removed. Likewise, all manholes shall be removed.

C. Pipelines shall be sealed with plugs or caps of the same material as the line, with thrust restraint where applicable. Where plugs or caps are not available, abandoned lines shall be plugged with concrete to prevent groundwater infiltrating the abandoned lines. Work to be in accordance with Standard Specifications, see Construction Drawings for detail.

D. Existing structures, boxes, pipes, and other items are to be removed, altered, re-located, salvaged, and / or disposed of as indicated on the Drawings or designated by the Engineer. All portions of these items that interfere with Work shall be removed and properly disposed.

E. Under no circumstances is there to be discharge of any sewage into storm waters.

F. Existing pavement, curb, walks, and associated items shall be removed and disposed of as indicated on the Drawings or designated by the Engineer. When partially removing pavement or curb, Contractor shall neatly saw cut at right angle to surface. All portions of these items that interfere with Work shall be removed and properly disposed.

G. All portions of items designated to be removed shall be removed in the entirety and any resulting void shall be filled with compacted material, in accordance with Standard Specifications. The ends of abandoned pipes that are designated to be left in place shall be plugged, capped, or filled with concrete to provide a watertight seal as specified hereinbefore.

H. The Contractor shall perform all Work in a manner that will not damage parts of the existing infrastructure not intended to be removed. If, in the opinion of the Engineer, the methods of removal, demolition, or cutting used may endanger of damage parts of the infrastructure or affect the satisfactory operation of the remaining infrastructure, the Contractor shall promptly change the method when notified by the Engineer. The Contractor shall examine the existing infrastructure and make a determination of required demolition and other conditions to be encountered in order to accomplish the Work. No blasting will be permitted for demolition activities.

I. Repair and replacement of existing elements required due to Contractor activities shall be made at the Contractor’s sole expense.

3.5 TEMPORARY PROTECTION MEASURES

A. The Contractor shall perform all Work to prevent damage to all existing facilities and make all provisions necessary to protect the Owner’s facilities from damage due the activities of the Contractor, including but not limited to, protection from dust, debris, water, humidity, and fumes.

3.6 SHUTDOWN OF EXISTING OPERATIONS AND UTILITIES

A. Existing utilities including, but not limited to, water, gas, telecom, and other subsurface utilities, are required to remain in services during construction and modification of the new and existing infrastructure.

B. All pedestrian, vehicular, and mobile equipment access shall be maintained during construction.

C. Existing site lighting and security shall be maintained at equal or better conditions during construction.

END OF SECTION

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

1.02 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Review the following:
   a. Special inspection and testing and inspecting agency procedures for field quality control.
   b. Construction, movement, contraction, and isolation joints
   c. Forms and form-removal limitations.
   d. Shoring and reshoring procedures.
   e. Anchor rod and anchorage device installation tolerances.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form ties.
4. Waterstops.
5. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
   a. Location of construction joints is subject to approval of the Architect.
3. Indicate location of waterstops.

1.05 INFORMATIONAL SUBMITTALS

A. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

B. Form facing materials: Store form facing materials under cover to protect from moisture, dirt, debris, and other degradation.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/360 of center-to-center spacing of supports.

2.02 FORM-FACING MATERIALS

A. Exposed As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete, and as follows:

a. Plywood, metal, or other approved panel materials.
b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

1) APA HDO (high-density overlay).
2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.

2.03 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.04 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
B. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

D. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.01 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, chamfer strips, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Space vertical joints in walls as indicated on Drawings.
    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.03 INSTALLATION OF WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.04 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations. Curing and protection operations need to be maintained at unformed surfaces and applied at formed surfaces immediately after removal of forms, for the remainder of the curing period.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.06 SPECIAL INSPECTIONS & FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports. Special Inspections shall be in accordance with Section 17 05 .3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.

B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories."
2. Section 033000 "Cast-In-Place Concrete."

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Architect.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For delegated-design engineer and testing and inspection agency.
B. Delegated-Design Engineer Qualifications: Include the following:

1. Experience providing delegated-design engineering services of the type indicated.
2. Documentation that delegated-design engineer is licensed in the state in which Project is located.

C. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

D. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

C. Mockups: Reinforcing for cast-concrete formed surfaces, to demonstrate tolerances and standard of workmanship.

1. Build panel approximately as indicated in Section 03 10 00 “Concrete Forming and Accessories.”

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.01 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Deformed bar Anchors: ASTM A1064, Fy = 75 ksi, deformed.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.02 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; dowel-bar type.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.03 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.02 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
B. Accurately position, support, and secure reinforcement against displacement.
   1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
   2. Do not tack weld crossing reinforcing bars.
C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
D. Provide concrete coverage in accordance with ACI 318.
E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
F. Splices: Lap splices as indicated on Drawings.
G. Install Deformed Bar Anchors with electric arch stud welding.
   1. Where Deformed Bar Anchor lengths are greater than can be welded by the electric arch stud welding process, lap splice shorter Deformed Bar Anchors with standard deformed Reinforcing Bars.
   2. At Contractor’s option, Deformed Bar Anchors may be substituted with Weldable Reinforcing, ASTM A706, and welded to structure with welds capable of developing the strength of the bar in accordance with AWS D1.4.
H. Install welded-wire reinforcement in longest practicable lengths.
   1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
      a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
   2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
   3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
   4. Lace overlaps with wire.

3.03 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement.
   2. Continue reinforcement across construction joints unless otherwise indicated.
   3. Do not continue reinforcement through sides of strip placements of floors and slabs.
B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.04 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.05 SPECIAL INSPECTIONS & FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports. Special Inspections shall be in accordance with Section 17 05 .3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.
B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
C. Inspections:
   1. Steel-reinforcement placement.
   2. Steel-reinforcement mechanical splice couplers.
   3. Steel-reinforcement welding.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 – Alternates."

C. Related Requirements:

1. Section 03 10 00 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 03 20 00 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 03 35 50 "Concrete Floor Hardening" for concrete floors scheduled to receive a burnished or polished finish.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special concrete finish Subcontractor.
2. Review the following:
   a. Special inspection and testing and inspecting agency procedures for field quality control.
   b. Construction joints, control joints, isolation joints, and joint-filler strips.
   c. Vapor-retarder installation.
   d. Anchor rod and anchorage device installation tolerances.
   e. Cold and hot weather concreting procedures.
   f. Concrete finishes and finishing.
   g. Curing procedures.
   h. Forms and form-removal limitations.
   i. Shoring and reshoring procedures.
   j. Methods for achieving specified floor and slab flatness and levelness.
   k. Floor and slab flatness and levelness measurements.
   l. Concrete repair procedures.
   m. Concrete protection.
   n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
   o. Protection of field cured field test cylinders.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Blended hydraulic cement.
4. Aggregates.
5. Admixtures:
    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
6. Vapor retarders.
7. Floor and slab treatments.
8. Liquid floor treatments.
9. Curing materials.
    a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
10. Joint fillers.
11. Repair materials.
12. CarbonCure Concrete Additives.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Maximum w/cm.
4. Calculated equilibrium unit weight, for lightweight concrete.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
    a. Amount of mixing water withheld and allowed to be added at project site is required to be included on the delivery ticket.
9. Intended placement method.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Control and Construction Joint Layout: Indicate proposed control and construction joints required to construct the structure.
    a. Location of control and construction joints are subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.

6. Adhesives.
7. Vapor retarders.
8. Joint-filler strips.
9. Repair materials.
10. CarbonCure Concrete Additives.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:
    a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.
9. CarbonCure Concrete Additives.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:
    a. Admixture dosage rates.
    b. Slump.
    c. Air content.

d. Water-Cement ratio.
e. Seven-day compressive strength.
f. 28-day compressive strength.
g. Standard deviation.
h. ACI required compressive strength
i. Unit weight.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

a. Maintain forms, steel reinforcement, embedded items, and subgrade temperature less than 115 deg F.

1.10 CARBON DIOXIDE (CO2) MINERALIZATION REQUIREMENTS (ALTERNATE)

A. Environmental / Sustainable Requirements

1. CO2 mineralized concrete is preferred where available, pending concrete performance criteria is met.
2. CO2 mineralization: Supply CO2 mineralized concrete, such that post-industrial carbon dioxide (CO2) is injected into the concrete like an admixture and chemically converted into a mineral. The concrete may undergo mix optimization whereby the strength enhancement property of the mineralized CO2 is utilized to adjust cementitious content, pending that the optimized concrete mix meets concrete performance requirements as outlined in this specification document.
3. Acceptable technologies: CarbonCure Ready Mix Concrete Technology.

a. The injection and subsequent mineralization of CO2 meets the requirements of ASTM C494 Type S admixture.

B. For CarbonCure ready mix concrete product availability and regional contact information, visit www.carboncure.com/producers.

C. For general inquiries contact info@carboncure.com or +1 (902) 442-4020.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, grey.
2. Fly Ash: ASTM C618, Class C or F.
3. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C330/C330M, 3/4-inch nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C260/C260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.03 CONCRETE PRODUCED WITH CO2 MINERALIZATION

A. Minimum cementitious content and maximum water/cementing materials ratio requirement as outlined by this specification will be reviewed and may be adjusted by the Engineer pending review of submittal, if required. Adjustment of cementitious content and water/cementing materials ratio requirement will be at the sole discretion of the Engineer.

2.04 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.01; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.05 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.06 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film, or burlap-polyethylene sheet.

1. Color:
   a. Ambient Temperature Below 50 deg F: Black.

b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

C. Curing Paper: Eight-feet- wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
D. Water: Potable or complying with ASTM C1602/C1602M.
E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.07 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.08 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.
B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.09 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.10 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings, grade beams, tie beams, and building foundation walls with externally applied waterproofing.

1. Exposure Class: ACI 318 F0 S0 W0 C1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content: No entrained air required.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
7. CarbonCure (Alternate)

B. Class B: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:
    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
7. CarbonCure (Alternate)

C. Class B.1: Normal-weight concrete used for interior slabs-on-ground with polished finish.

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: 5,000 psi min, or as indicated at 28 days.
3. Maximum w/cm: 0.4.
4. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content:
    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
7. CarbonCure (Alternate)

D. Class C: Structural lightweight concrete used for interior suspended slabs.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C567/C567M.
3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
4. Air Content:
   a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
6. CarbonCure (Alternate)

E. Class D: Normal-weight concrete used for interior metal pan stairs and landings:

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.5.
4. Minimum Cementitious Materials Content: 470 lb/cu. yd..
5. Maximum Size Aggregate: 1/2 inch.
6. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
7. Air Content: No entrained air required.
8. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
9. Retarding Admixture: Not allowed.
10. Accelerating Admixture: Not allowed.

F. Class E: Normal-weight concrete used for exterior slab-on-grade in the mechanical yard

1. Exposure Class: ACI 318 F2 S0 W0 C1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.50.
4. Slump Limit: 5 inches, plus or minus 1 inch or 8 inches, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
7. CarbonCure (Alternate)

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.04 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.05 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Do not place concrete floors and slabs in a checkerboard sequence.
   2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   3. Maintain reinforcement in position on chairs during concrete placement.
   4. Screed slab surfaces with a straightedge and strike off to correct elevations.
   5. Level concrete, cut high areas, and fill low areas.
   6. Slope surfaces uniformly to drains where required.
   7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
   8. Do not further disturb slab surfaces before starting finishing operations.

3.07 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
   1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
      b. Remove projections larger than 1 inch.
      c. Tie holes do not require patching.
      d. Surface Tolerance: ACI 117 Class D.
      e. Apply to concrete surfaces not exposed to public view.
   2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
      a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
      b. Remove projections larger than 1/4 inch.
      c. Patch tie holes.
      d. Surface Tolerance: ACI 117 Class B.
      e. Locations: Apply to concrete surfaces exposed to public view, or as indicated.
   3. ACI 301 Surface Finish SF-3.0:

a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/8 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class A.
e. Locations: Apply to concrete surface as indicated.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.08 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
4. Apply float finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system when the total air content of concrete exceeds 3 percent.
    a. Coordinate required final finish with Architect before application.
    b. Comply with flatness and levelness tolerances for trowel-finished floors.

D. Float and Fine-Broom Finish.

1. Immediately after float finishing, while concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route
2. Apply to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method when the total air content of concrete exceeds 3 percent.
    a. Coordinate required final finish with Architect before application.
    b. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Trowel Finish – Suspended Slabs:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.

6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system, where the total air content of concrete is less than 3 percent.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
    a. Suspended Slabs:
        1) Specified overall values of flatness, F_F 35.

F. Trowel Finish –Slabs on Ground:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven hard steel trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance, minimum 3 passes.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings, ACI 302.1R Class 5, without burn marks.
4. Do not add water to concrete surface.
5. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system, where the total air content of concrete is less than 3 percent.
6. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
    a. Slabs on Ground:
        1) Specified overall values of flatness, F_F 50; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 20.

G. Trowel and Fine-Broom Finish: Apply a first trowel finish; while concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route. Apply to surfaces indicated on Drawings, where total air content of concrete does not exceed 3 percent.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

H. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.09 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 3500 psi at 28 days.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
   1. Cast-in inserts and accessories, as shown on Drawings.
   2. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
   3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
      a. Curing Period: 10 days.
   2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
   3. If forms remain during curing period, moist cure after loosening forms.
   4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
      b. Continuous Sprinkling: Maintain concrete surface continuously wet.
      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
      d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
      e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
         1) Recoat areas subject to heavy rainfall within three hours after initial application.
         2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.
      a. Curing Period: 10 days typical, 28 days for surfaces to receive a polished concrete finish
   2. Interior Concrete Floors:
      a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
         1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
         2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with

sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

d. Floors to Receive Chemical Stain:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
3) Butt sides of curing paper tight; do not overlap sides of curing paper.
4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than three days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.

e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
   a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
   b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
   a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
   a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
   a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
   b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
   b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
   c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
   d. Place, compact, and finish to blend with adjacent finished concrete.
   e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
   b. Dampen cleaned concrete surfaces and apply bonding agent.
   c. Place patching mortar before bonding agent has dried.
   d. Compact patching mortar and finish to match adjacent concrete.

e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 SPECIAL INSPECTIONS & FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. Special Inspections shall be in accordance with Section 17 05 .3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.

B. Field Quality Control: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Special Inspector Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Special Inspector Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Special Inspector Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.

6. Batch Plant Inspections: On a random basis, as determined by Architect.
7. Post-installed anchors in hardened concrete.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 100 cu. yd. or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure five 4-inch by 8-inch standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of one laboratory-cured specimens at seven days and one set of two specimens at 28 days, and one at 56 days. At 28 days, if first two specimens meet design strength, test an additional specimen, and if not, hold specimen for testing at a later date. Maintain remainder of specimens in reserve for later testing if required.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 03 35 50 - CONCRETE FLOOR HARDENING

PART 1 GENERAL

1.01 SUMMARY

A. Hardened and burnished concrete floors.

B. Hardened and polished concrete floors.

1.02 REFERENCES

A. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

B. ANSI/NFSI B101.3 - Test Method for Measuring the Wet DCOF of Hard Surface Walkways; 2020.

C. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

D. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

F. ASTM C779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces; 2019.

G. ASTM C805 - Standard Test Method for Rebound Number of Hardened Concrete; 2018.

H. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2017.

I. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

J. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

K. ASTM G152 - Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetalic Materials; 2013.

1.03 SUBMITTALS

A. Product Data.

B. Hardening compound manufacturer's detailed application instructions.
   1. Cleaning prior to application.
   2. Hardening.
   3. Burnishing.
   4. Polishing.

C. Hardening compound manufacturer's floor care instructions: daily/monthly/annually.

D. Installer Qualifications.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Certified by and trained by the manufacturer for application of flooring products specified herein.

B. Notification: Give at least 7 calendar days' notice before date established for commencement of work to:
   1. Hardening compound manufacturer's technical representative.

C. Mockups:
   1. Construct mock-up to match the Architect's sample.
   2. Construct mockup in one entire space at location selected by Architect, unless otherwise directed.
   3. Construct mockup using materials, processes, and techniques required for the work, including curing procedures. Incorporate representative control, construction, and expansion joints according to Project requirements.
   4. Obtain the Architect's and Owner's acceptance of mockup prior to commencement of the work.

5. Mockup to remain until completion of the work to serve as a quality control standard for the work. Provide suitable protections to preclude damage to mockup.

1.05 PROJECT CONDITIONS

A. Schedule construction activities so that operations that occur before floor finishing do not cause permanent, inadvertent staining or damage to substrates. Provide protection as necessary.

B. Schedule construction activities so that operations that occur after floor finishing do not cause permanent, inadvertent staining or damage to finished floors. Provide protection as necessary.

C. Provide at least 50 foot candles (538.2 Lux) of uniform illumination during floor finishing operations.

1.06 MAINTENANCE PRODUCTS

A. Provide 6 months maintenance supply of cleaning agent for Owner's use.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Sustainability Requirements:
1. Provide clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements complying with South Coast Air Quality Management District SCAQMD 1113 rules in effect for VOC content limits as follows:
a. Sealers:
1) All Other Sealers: 200 g/l.

2.02 PRODUCTS

A. Hardened and Burnished Concrete Floor Finish:
1. Penetrating, sodium silicate based, chemically hardening compound that reacts with free lime and calcium carbonate in the concrete paste. Lithium based compounds not acceptable. Topical, film-forming compounds not acceptable. Suitable for burnishing to a satin sheen.
a. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
b. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
c. Hardening: As follows when tested in accordance with ASTM C39/C39M:
1) After 7 Days: An increase of at least 40% over untreated samples.
2) After 28 Days: An increase of at least 38% over untreated samples.
d. Dynamic Coefficient of Friction (DCOF): Minimum 0.42, wet when tested in accordance with ANSI/NFSI B101.3.
e. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
f. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G152.
2. Basis of Design: "The Ashford Formula"; Curecrete Chemical Company.
3. Other acceptable products, subject to manufacturer's acceptance of project conditions and submission of detailed application instructions for all products specified in this Section:
a. "Chemisil"; ChemMasters.
b. "Industraseal"; US Mix Co.

B. Hardened and Polished Concrete Floor Finish:
1. Penetrating, sodium silicate based, chemically hardening compound that reacts with free lime and calcium carbonate in the concrete paste. Lithium based compounds not acceptable. Topical, film-forming compounds not acceptable. Suitable for diamond grit polishing to the specified level.
2. Performance Criteria:
a. Abrasion Resistance: ASTM C779 - Up to 400% increase in abrasion resistance.

b. Impact Strength: ASTM C805 - Up to 21% increase impact strength.
c. Ultra Violet Light and Water Spray: ASTM G152 - No adverse effect to ultra violet and water spray.
d. Reflectivity: Up to 30% increase in reflectivity.

3. "Retro-Plate 99"; Advanced Floor Products, Inc., P.O. Box 50533, Provo, Utah 84605, 801-812-3420.

C. Diamond Grinding and Polishing Discs; distributed by Advanced Floor Products.

D. Burnishing pads; distributed by Advanced Floor Products.

E. Crack and Joint Fillers:
1. "CreteFill Pro" series; CureCrete Chemical Company.
2. "CreteFill Crack Repair" series; CureCrete Chemical Company.
3. Color as selected by the Architect.

F. Compounds for Cracks, Spalls, and Other Repairs:
1. "CreteFill" series; CureCrete Chemical Company.
2. Color to match adjacent concrete and as approved by the Architect based on mock-up.

G. Chemical Cleaning Agents:
1. Basis of Design: "Preclean Plus"; Curecrete Chemical Company.
2. Other acceptable products: As recommended by hardening compound manufacturer.

H. Maintenance Supplies:
1. "CreteClean Plus"; CureCrete Chemical Company.

PART 3 EXECUTION

3.01 PRE-APPLICATION REQUIREMENTS

A. Petroleum and hydraulic fluid stains typically cannot be removed. Do not allow the use of equipment that might permanently stain.

B. Where use of equipment containing hydraulics is essential, diaper the equipment.

C. Do not park vehicles in areas to be finished.

D. Provide non-marking (white) tires on equipment.

E. Do not scratch or chip floors.

F. Do not allow pipe cutting machinery (manual or powered) in areas to be finished.

G. Do not place steel on floors to avoid rust staining.

H. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.

3.02 PREPARATION

A. Remove contaminants and existing coatings from concrete surfaces to receive floor finish. Perform operations in accordance with hardening compound manufacturer's detailed written instructions.

B. Ensure that concrete surfaces are completely penetrable before applying the initial application of chemical stain or hardening compound. Chemically clean or mechanically abrade the surface of the concrete to remove weak cement paste and contaminants and coatings. The final surface preparation shall approximate a Concrete Surface Profile of 1, (CSP1 as designated by the International Concrete Repair Institute, Alexandria, Virginia) unless otherwise recommended by hardening compound manufacturer and approved by the Architect. Contractor shall select methods to achieve the required result without damage to existing project surfaces to remain. Methods for mechanical abrasion include:
1. Pressure Washing: Use a pressure washer equipped with a fan tip and rated for a minimum pressure capability of 4000 psi (27.5 MPa).
2. Scrubbing with a rotary floor machine with a Mal-Grit Brush from the Malish Corporation.
3. Light sanding of the surface.
4. Other methods approved by the hardening compound manufacturer.

C. Control water to avoid damage to other building materials. Rinse concrete substrates until rinse water is completely clean.

D. Control dust using HEPA filtration equipment approved by the Contractor's competent person in charge of worker safety. Remove dust from surface.

3.03 SURFACE REPAIRS

A. Repair surface defects such as spalls, divots, cracks, unevenness, lippage, etc., in accordance with hardening compound manufacturer's recommendations using products and procedures recommended by hardening compound manufacturer.

3.04 JOINTS

A. Expansion Joints and Contraction Joints: Install joint filler specified in Part 2 of this Section.

B. Install joint filler in freshly prepared joints that have mechanically abraded, open, porous, clean, dust-and-oil-free joint faces.

3.05 INITIAL GRINDING

A. Grind floors to receive polished finish so as to match the approved mock-up.

B. Aggregate Exposure:
   1. Class B - Salt/Pepper finish.

C. Swirl marks are not acceptable.

3.06 HARDENING AND BURNISHING

A. Cured Concrete: Apply hardener only to clean, bare concrete.
   1. Saturate surface with hardener; re-spray or broom excess onto dry spots.
   2. Keep surface wet with hardener for a minimum soak-in period of 30 - 40 minutes.
   3. If most of the material has been absorbed after the 30 minute soak-in period, remove all excess material, especially from low spots, using broom or squeegee.
   4. If most of the material remains on the surface after the 30 minute soak-in period, wait until the surface becomes slippery and then flush with water, removing all cure-seal-hardener residue. Squeegee completely dry, flushing any remaining slippery areas with clean water until no residue remains.

B. Burnishing:
   1. Burnish horizontal surfaces to a uniform satin sheen.

3.07 HARDENING AND POLISHING

A. Apply hardening compound in accordance with manufacturers recommendations.

B. Polish the floor using diamond polishing pads, starting with 100 grit and continuing with passes of successively finer grit until specified level of polish is achieved to match the approved mock-up.

C. Specified Overall Gloss Value, ASTM D523:
   1. Level 2 - Medium Gloss; 800 grit polish; gloss reading of 20-30.

D. Minimum Local Gloss Value shall not be visibly objectionable.

E. Swirl marks are not acceptable.

3.08 PROTECTION

A. Protect installed floors for at least 3 months until chemical reaction process is complete.
   1. Do not allow traffic on floors for 3 hours after application.
   2. Do not allow parking of vehicles on concrete slab.
   3. Do not park equipment on slab.
   4. Do not allow pipe cutting on concrete slab.
   5. Do not allow temporary placement and storage of steel members on concrete slabs.
   6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
   7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Architectural precast concrete units for exterior use, finish face exposed to view.
    a. Stair treads and Site Seatwalls.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing connection anchors in concrete.
2. Section 071900 "Water Repellents" for water-repellent finish treatments.

1.03 DEFINITIONS

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

D. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at stair and seatwall corners.
5. Indicate separate face and backup mixture locations and thicknesses.
6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
9. Include plans and elevations showing unit location and sequence of erection for special conditions.
10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
11. Indicate relationship of architectural precast concrete units to adjacent materials.

12. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

E. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 6 inches. Sample shall be representative of specified architectural finish, color, and texture on 5 faces with bottom hidden face matching fabricator standard finish and texture.

1. Architectural precast concrete finish shall match finish, color, and texture of precast concrete on project, as selected by Architect from full range of cast stone manufacturer's full range. Architectural precast fabricators shall collaborate with cast stone fabricators as necessary to provide finished products of similar likeness to obtain architect approval of both architectural precast and cast stone samples. Contractor is responsible for ensuring sample selections and approved sample ranges are shared between architectural precast and cast-stone manufacturer for continual access to approved sample selections between all parties.
2. Multiple faces of architectural precast concrete units will be exposed to view as indicated in construction drawings. All exposed faces shall have consistent finish, color, and texture.
3. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
4. Include Sample showing color and texture of joint treatment.
    a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
    b. Grout Samples for Verification: Showing color and texture of joint treatment.

F. Delegated-Design Submittal: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Welding certificates.

C. Material Certificates: For the following items:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Other miscellaneous components as required by delegated-design professional engineer.
6. Structural-steel shapes and hollow structural sections.

D. Material Test Reports: For aggregates.

E. Preconstruction test reports.

F. Source quality-control test reports.

G. Welder certification.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units at time of bidding.

B. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

C. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 48x12x12 in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

D. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build wall mockup approximately 48 inches wide by 18 inches height and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
2. Build stair mockup approximately 48 inches wide by 18 inches height consisting of 3 six-inch risers. Provide joint for filling with joint fillers for joint color and finishing review and approval.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undamaged at time of Final Acceptance.

1.08 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, to design architectural precast concrete units, reinforcing to meet APA standards.

B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: Delegated-design professional engineer shall design loads per NC Building code.
2. Design precast concrete units and connections to maintain clearance at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of other structures, and other structure movements, and thermal movements as determined by delegated-design professional engineer.

2.02 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration to match those used for precast concrete design reference sample. Use with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.03 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.

D. Galvanized Reinforcing Bars: ASTM A615/A615M, Grade 60 ASTM A706/A706M, deformed bars, with ASTM A767/A767M, Class II zinc coating and chromate treatment.

E. Epoxy-Coated Reinforcing Bars: ASTM A615/A615M, Grade 60 ASTM A706/A706M, deformed bars, ASTM A775/A775M or ASTM A934/A934M epoxy coated.

F. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, Grade 420 ASTM A706/A706M, deformed bars, assembled with clips.

G. Plain-Steel Welded Wire Reinforcement: ASTM A185/A185M, fabricated from steel wire into flat sheets.

H. Deformed-Steel Welded Wire Reinforcement: ASTM A497/A497M, flat sheet.

I. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A coated, plain or deformed, flat sheet, Type 1 or Type 2 nonbendable coating.

J. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C618, Class N.
3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
5. Blended Hydraulic Cement: ASTM C595, Type IS, portland blast-furnace slag, Type IP, portland-pozzolanType I (PM), pozzolan-modified portland Type I (SM), slag-modified portland cement.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

D. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C330/C330M, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

G. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
7. Plasticizing Admixture: ASTM C1017/C1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

9. Corrosion Inhibiting Admixture: ASTM C1582/C1582M.

2.05 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.06 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

1. Warpage Tolerance: Plus 0 inch or minus 1/16 inch.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use a single design mixture for units with more than one major face or edge exposed.
2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.

B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C1218/C1218M.

E. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.

G. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.

H. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

I. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.08 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
   1. Form joints are not permitted on faces exposed to view in the finished work.
   2. Edge and Corner Treatment: Uniformly radiused 1/8 inch radius.

2.09 FABRICATION

A. All cast-in hardware shall be located to be hidden from all exposed views upon final installation of architectural precast concrete units.

B. All reinforcement shall be designed not to conflict with site-installed handrail posts, locations as noted in drawings.

C. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
   1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

D. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

E. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

F. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

G. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
   2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
   3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
   4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

H. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

I. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

J. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

K. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
   1. Place backup concrete mixture to ensure bond with face-mixture concrete.

L. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
   1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

M. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

N. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

O. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

P. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.10 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with the following product tolerances (refer to drawings and details for additional dimensions):
   1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
      a. 10 feet or under, plus or minus 1/8 inch.
      b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
      c. 20 to 40 feet, plus or minus 1/4 inch.
   2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
      a. 10 feet or under, plus or minus 1/4 inch.
      b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
      c. 20 to 40 feet, plus or minus 3/8 inch.
   3. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch/72 inches or 1/2 inch total, whichever is greater.
   4. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
   5. Location and Dimension of Block-outs within One Unit: Plus or minus ¼ inch.
   6. Dimensions of Haunches: Plus or minus 1/4 inch.
   7. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
   8. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch.

9. Bowing: Plus or minus L/360, maximum 1 inch.
10. Local Smoothness: 1/4 inch/10 feet.
11. Warping: 1/16 inch/12 inches of distance from nearest adjacent corner.
12. Tipping and Flushness of Plates: Plus or minus 1/4 inch.

C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Reinforcement: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Electrical Outlets, Irrigation Controlller, LED lighting, Hose Bibs: Plus or minus 1/2 inch.
10. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.
11. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of unit.
12. Position of Sleeve: Plus or minus 1/2 inch.

2.11 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved mockups and as follows:

B. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.12 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.

B. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

C. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M and ACI 318.

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition.
3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:

a. Project identification name and number.
b. Date when tests were performed.
c. Name of precast concrete fabricator.
d. Name of concrete testing agency.
e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

E. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
   1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
   2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
   3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A780/A780M.
   4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
   1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
   2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:
      a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
      b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
      c. Twist-off Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
      d. Direct-Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
   3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.03 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Erect architectural precast concrete units level, plumb, square, and in alignment, without exceeding the following noncumulative erection tolerances:
   1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
   2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
   3. Top Elevation from Nominal Top Elevation: 1/8” inch.
   4. Plumb in Any 10 Feet of Element Height: 1/4 inch.
   5. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
   6. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
   7. Maximum Joint Taper: 3/8 inch.
   8. Joint Taper in 10 Feet: 1/4 inch.
   9. Maximum Jog in Alignment of Matching Faces: 1/4 inch.

10. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.

B. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.05 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.06 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION

SECTION 04 01 20 - MASONRY CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning New Masonry.

1.02 CLEANING STANDARD REQUIRED:

A. General:
   1. Clean masonry to remove mortar scum and mortar droppings.
   2. Degree of cleanliness in the Work shall match that achieved in the approved mock-ups.

1.03 SUBMITTALS

A. Product Data:
   1. Submit for each cleaning agent (detergent, chemical, etc.).
   2. Submit manufacturer's detailed application instructions for proprietary cleaners.

B. Submit masonry unit manufacturer's recommendations for cleaning agents.

C. Submit a description of proposed protection of surrounding materials on building and Project site, and control of runoff during operations. Describe in detail the materials, methods, and equipment to be used.

D. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.04 QUALITY ASSURANCE

A. Mockups: Prepare field samples for cleaning procedures to demonstrate aesthetic effects and qualities of materials and execution. Use materials and methods proposed for completed Work and prepare samples under same weather conditions to be expected during remainder of Work.
   1. Clean temporary masonry mockup. Do not perform cleaning on the actual building.
   2. After review by the Architect, prepare additional samples, adjusting materials, methods, timing, etc., as necessary to clean masonry to required finish.
      a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions, unless cleaners and methods are known to have a deleterious effect.
      b. Allow a waiting period of not less than 14 days after completion of sample cleaning to permit a study of sample panels for negative reactions.
   3. Notify Architect 7 days in advance of the dates and times when samples will be prepared.
   4. Obtain Architect's approval of mockups before starting the remainder of restoration and cleaning.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.05 DEFINITIONS

A. All pressures measured at discharge end.

B. Garden Spray: Spray of hand-pump-up garden-type (“Hudson”) sprayer with nozzle adjusted to a cone-shape. Powered garden-type sprayers providing equivalent spray are also acceptable. Stainless steel or plastic parts required (galvanized not acceptable).

C. Very-Low Pressure Spray: 30 psi (0.2 MPa) (nominal) through a 3/4 inch (20 mm) diameter hose fitted with a nozzle producing a conical spray of approximately 60 degrees applied at a distance not closer than 4 feet (1.2 m) from the surface. Provide pressure/volume/cut-off valve at discharge end.

D. Low-Pressure Spray: 100 psi (0.7 MPa) to 200 psi (1.4 MPa); 4 to 6 gpm.

E. Medium-Pressure Spray: 200 psi (1.4 MPa) to 600 psi (4 MPa); 4 to 6 gpm.

F. High-Pressure Spray: 600 psi (4 MPa) to 1200 psi (8.3 MPa); 4 to 6 gpm.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with type and name of product and manufacturer.

B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.07 PROJECT CONDITIONS

A. Clean surfaces only when air temperature is 40 deg F (4.5 deg C) and above and will remain so for at least 7 days after completion of cleaning.

1.08 SEQUENCING AND SCHEDULING - NEW MASONRY

A. Clean masonry in a timely manner and within the time limitations recommended by the mortar manufacturer and liquid cleaner manufacturer - generally within 7 to 21 days after brick masonry is installed and within 14 to 28 days after stone masonry is installed, depending on temperature and mortar strength.

B. Perform masonry cleaning and restoration work in the following sequence:
   1. Install temporary materials where required to prevent entry of water or chemicals into interior of masonry work, windows, doors, louvers, and other openings.
   2. Protect from damage windows, doors, louvers, and other openings as well as other non-masonry surfaces that are not to be cleaned. Provide temporary masking of such surfaces where cleaners might damage such surfaces.
   3. Clean masonry surfaces.

PART 2 PRODUCTS

2.01 MATERIALS

A. Water: clean, potable water.

B. Warm water for mixing cleaning solutions.

C. pH paper with 3 colors to identify numeric pH level.

2.02 MIXES

A. Liquid Cleaners for New Clay or Concrete Masonry:
   1. VanaTrol; Prosoco, Inc.
   2. Fabrikem New Masonry Cleaner Type L; Fabrikem.
   3. 202V Vana-Stop; Diedrich Technologies, Inc.

B. Liquid Cleaner for Calcium Silicate Masonry:
   1. Calcium Silicate Cleaner; EaCoChem.
   2. Other cleaner recommended in writing by calcium silicate masonry manufacturer.

2.03 TEMPORARY COVERS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished masonry surfaces from the damaging effects of acidic and alkaline masonry cleaners.

B. Polyethylene Sheet.

C. Adhesive Tape: Non-staining, leaving building surface residue-free after tape is removed.

PART 3 EXECUTION

3.01 PROTECTION

A. The Building: Where cleaners and rinses have not been demonstrated to be non-deleterious to non-masonry portions of the building, provide temporary masking of non-masonry surfaces.

B. Control of Runoff:

1. Do not allow cleaners and rinses to collect, pond, or form soft muddy conditions at the base of the building that do not dissipate within 24 hours.

C. Protection of Vegetation: A portion of the existing plant life is indicated elsewhere in the Contract Documents to be removed. Do not allow cleaners and rinses to contact vegetation to remain.

D. If inadvertent spills of cleaner contact vegetation or other building elements, rinse immediately with potable water until free of cleaner.

E. Do not apply sprays during windy conditions sufficient to carry overspray into contact with other surfaces, vegetation, or people.

3.02 CLEANING, GENERAL

A. Identify “panels” of the building to be cleaned sequentially.

B. Proceed within each panel from the base of the building to the top, unless otherwise approved.

C. Prewetting:
1. As cleaning proceeds upward, maintain lower portions and immediately adjacent portions continuously wet and streak-free and soil-free.
2. Extend the wetted area horizontally beyond the immediate area to be cleaned.
3. Wet the area beneath the area to be cleaned, from grade level up to the area to be cleaned.
4. Maintain these adjacent areas wet with water until rinsing is complete to avoid streaking and deposition of cleaners and residues onto adjacent surfaces.

D. Thoroughly remove cleaners by rinsing with potable water. A final rinse shall be performed from the top of the building down to the base of the building.

E. Clean building surfaces in a uniform manner. Include flat surfaces, cornices, moldings, ornament, recesses, tops and undersides, etc., to produce a uniformly clean result.

F. Do not apply different cleaners on a given area unless the cleaner used previously has been thoroughly washed away.

G. Adjustments to meet Project Conditions:
1. Repeat cleaning procedures or adjust dwell times or adjust the amount or type of scrubbing effort or adjust concentration of cleaners (or a combination of the preceding), depending upon the amount and type of soil or stain present on the various parts of the building, and so as to achieve a uniformly clean result and without change in Contract Time or Price.
2. Obtain the Architect’s approval of such adjustments.
3. Do not exceed concentrations or dwell times or repeat procedures beyond the limits specified or approved by the Architect.

3.03 SPRAYS

A. Do not use power-assisted spray without the written authorization of the Architect.

B. Provide very low pressure spray, taking water from hose bibbs to portions of the building required to be cleaned.

C. If the Architect determines that unassisted pressure at hose-end from the building water supply does not provide adequate pressure or volume, provide power-assisted spray adjusted to simulate very-low pressure spray without change in Contract Time or Price. Obtain the written authorization from the Architect.

D. If the Contractor so requests and the Architect determines that due to remote location or configuration or other Project factors, it is impracticable to use hoses to rinse selected portions, provide power-assisted spray adjusted to simulate very-low pressure spray without change in Contract Time or Price. Obtain the written authorization from the Architect.

3.04 APPLICATION OF LIQUID CLEANERS

A. Remove as much plant growth as possible using a knife blade and stiff bristle brush. Dry-brush the surface before wetting to remove bulk growth.

1. Pre-wet the area to be cleaned (and the adjacent areas) with a water spray.
   a. Extend the wetted area horizontally beyond the immediate area to be cleaned.
   b. Wet the area beneath the area to be cleaned, from grade level up to the area to be cleaned.
   c. Maintain these adjacent areas wet with water until rinsing is complete to avoid streaking and deposition of cleaners and residues onto adjacent surfaces.
2. Apply the solution to the affected area using either a garden spray or medium-stiff natural bristle brush. Use large, flat brushes for flat areas; use small brushes to access recesses, reveals, and detail of ornament.
   a. Scrub with a natural or artificial bristle brush and allow to dwell as necessary depending on degree of soiling and application temperatures.
   b. Dwell times are estimated to be 20 to 30 minutes between 40 deg F (4.5 deg C) and 70 deg F (21 deg C), and 10 to 15 minutes at 70 deg F (21 deg C) and above, but may range up to an hour or longer depending upon degree of soiling, scrubbing effort, and other factors. Consult manufacturer for required dwell time for the product being used.
   c. Do not allow cleaners to dry out. Reapply cleaner or mist with water to keep the surface saturated, and scrub periodically until the growth, stain, or soil is removed.
3. After-Wash, where indicated by manufacturer's instructions:
   a. Thoroughly rinse cleaner from surface with low-pressure spray water.
   b. Immediately apply after-wash to surface and allow to dwell for 3 to 5 minutes.
4. Thoroughly rinse the surface with low-pressure spray water.
   a. Test liquid rinse run-off drops with pH paper to ensure that cleaning solutions have been effectively removed. Continue rinsing until pH is neutral. (pH testing of liquid detergent is not required or effective.)
   b. Allow to dry.
   c. Test as often as necessary to ensure reliable, repeatable results and when otherwise requested by the Architect.
5. Use prepared solutions within 24 hours.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Concrete Block.
   2. Clay or Calcium Silicate Facing Brick.
   3. Mortar and Grout.
   4. Reinforcement and Anchorage.
   5. Accessories.

B. Products Installed but not Furnished Under this Section, Including, but not Limited to:
   1. Items specified elsewhere and which are built into masonry.
   2. Lintels.
   3. Frames for openings.
   4. Anchors for built-in items.
   5. Inserts and connectors.
   6. Utility items.

C. Products Furnished but not Installed Under this Section, Including, but not Limited to:
   1. Insulation retainer clips.

D. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).

F. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2020.

G. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2022a.

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2021.

M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

O. ASTM C476 - Standard Specification for Grout for Masonry; 2020.

P. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2017.

Q. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2021.

R. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

S. ASTM C73 - Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick), 2017.

T. “Standard Practice for Bracing Masonry Walls Under Construction”, Council for Masonry Bracing.

1.03 DEFINITIONS

A. As listed in TMS 402/602.

1.04 SUBMITTALS

A. Product Data:
   1. Masonry units.
   2. Cementitious materials.
   3. Reinforcing steel.
   4. Joint reinforcement.
   5. Anchors.
   6. Accessories.

B. Other Product Data - Test Reports:
   1. Masonry units: Net area compressive strength.
      a. Where less than 50,000 sq.ft (4645 sq.m) of masonry is required, submit test results of net area compressive strength of units based on standard plant runs.
      b. Where 50,000 sq.ft (4645 sq.m) or more of masonry is required, submit test results of net area compressive strength of units based on actual lots produced for the project, and tested at least once per 50,000 sq.ft (4645 sq.m).
   2. Sand: Sieve analysis and aggregate void ratio. Perform test not more than 60 days before date of submittal.
   3. Mortar:
      a. Mix design: Proportions of each material by volume.
   4. Grout Mix Design:
      a. Proportions of each material.
      b. Compressive strength test results.
   5. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of maonsry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

C. Shop Drawings:
   1. Specially shaped units.
   2. Sizes, locations, and fabrication dimensions of reinforcing steel.
   3. Design data for engineered veneer anchors:
   4. For veneer anchors used in cavities larger than 4.5 inches (115 mm), submit design data prepared by the veneer anchor manufacturer demonstrating that anchors comply with the requirements of the Building Code / TMS 402/602; design data shall bear the seal of a professional engineer licensed to practice in the State in which the Project is located.

D. Office Samples:
   1. Mortar: 2 inches (50 mm) samples.
   2. Masonry units demonstrating full range of color and texture.

1.05 BRICK AND MORTAR SAMPLE PANELS

A. Where new work is specified to match a stated color:
   1. Prepare sample panel demonstrating proposed mortar color and masonry units.
   2. Construct panel on site in a location designated by the Architect.
   3. Size: 4 feet (1.2 m) high by 4 feet (1.2 m) wide, plus a portable sample 5 courses high by 2 feet (0.6 m) wide.
   4. The appearance of mortar, joint work, coursing, and masonry units in the sample panel will be evaluated by the Architect in accordance with “Appearance of Completed Work” at the end of this Section.

B. If a sample panel is not approved, make appropriate adjustments and construct additional panels.

1.06 MOCK-UP

A. Construct exterior wall mock-up as indicated in Section 01 43 40.

B. Mock up each type of masonry work and obtain the Architect's approval before proceeding with full production.

C. Construct mock-ups on separate, temporary foundations in locations on the site identified by the Architect.
   1. Mock-ups shall not remain as a part of permanent work. Remove from the site when directed by the Architect.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not allow materials to become damaged or contaminated by other materials.

B. Provide on-site storage of masonry units required for not less than 4 weeks production.
   1. Store units raised above ground on pallets or similar flooring to prevent moisture pick-up.
   2. Store units under cover to prevent moisture pick-up from rain or snow.
   3. Do not tarp or wrap units so as to trap moisture or to permit condensation to form.
   4. Allow air to circulate freely around units.
   5. Use only masonry units that have been stored thus for not less than 3 weeks.

C. Sand:
   1. Maintain sand at a constant moisture content.
   2. Cover pile when not in use.
   3. Arrange pile for free drainage.
   4. Do not use the bottom portion of the pile (wet or in contact with earth) in mortar.
   5. At Contractor's option use bagged, kiln-dried sand.

D. Cement and Lime:
   1. Store materials raised above ground on pallets or similar flooring to prevent moisture pick-up.
   2. Store materials under cover to prevent moisture pick-up from rain or snow.
   3. Do not tarp or wrap materials so as to trap moisture or to permit condensation to form.
   4. Allow air to circulate freely around units.
   5. Do not use bags that have been broken or exposed to moisture.

E. See additional requirements under “In-Progress Cleaning” at the end of this section.

1.09 PROJECT SITE CONDITIONS

A. Cold Weather Requirements. When either the ambient air temperature or the temperature of masonry units is below 40 deg F. (4.5 deg C.):
   1. Submit proposed procedures to the Architect.
   2. Materials:
      a. Ensure that temperature of masonry units is greater than 20 deg F. (- 6.5 deg C.) when laid in the masonry.
      b. Remove visible ice from masonry units before laying in the masonry.
      c. Heat mortar sand or mixing water to produce mortar temperatures between 40 deg F. (4.5 deg C.) and 120 deg F. (49 deg C.) at the time of mixing. Maintain mortar above freezing until used in masonry.
   3. Protection when laying masonry:
      a. Use heat sources when ambient temperature is between 20 deg F. (- 6.5 deg C.) and 25 deg F. (-4.0 deg C.) on both sides of the masonry under construction.
      b. Provide wind breaks when wind velocity is in excess of 15 mph (24 km/hr).

c. When ambient temperature is below 20 deg F (- 6.5 deg C), provide temporary enclosure for the masonry under construction and provide temporary heat to maintain temperature above 32 deg F (0 deg C) within the enclosure.

4. Protection after laying masonry:
   a. When mean daily temperature (average of high and low) is between 32 deg F (0 deg C) and 40 deg F (4.5 deg C), protect completed masonry from rain or snow by covering with a weather-resistant membrane for 24 hours after construction.
   b. When mean daily temperature (average of high and low) is between 25 deg F (-4.0 deg C) and 32 deg F (0 deg C), completely cover completed masonry with a weather-resistant membrane for 24 hours after construction.
   c. When mean daily temperature (average of high and low) is between 20 deg F (- 6.5 deg C) and 25 deg F (-4.0 deg C), completely cover completed masonry with insulating blankets for 24 hours after construction.
   d. When mean daily temperature (average of high and low) is below 20 deg F (- 6.5 deg C), maintain the temperature of masonry above 32 deg F (0 deg C) for 24 hours after construction by providing temporary enclosure with temporary heat, by providing electric heating blankets or infrared heat lamps, or by other approved methods.

B. Hot weather construction.
1. Submit proposed procedures to the Architect.
2. Preparation. The following requirements shall be met prior to conducting masonry work.
   a. Temperature. When the ambient temperature exceeds 100 deg F (38 deg C), or exceeds 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h) :
      1) Necessary conditions and equipment shall be provided to produce mortar having a temperature below 120 deg F (49 deg C).
      2) Sand piles shall be maintained in a damp, loose condition.
   b. Special conditions. When the ambient temperature exceeds 115 deg F (46 deg C), or 105 deg F (40 deg C) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition, provide shade so that direct sunlight does not fall on materials and mixing equipment.
3. Construction. The following requirements shall be met while masonry work is in progress.
   a. Temperature. When the ambient temperature exceeds 100 deg F (38 deg C), or exceeds 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h):
      1) The temperature of mortar and grout shall be maintained below 120 deg F (49 deg C).
      2) Mixers, mortar transport containers and mortar boards shall be flushed with cool water before they come into contact with mortar ingredients or mortar.
      3) Mortar consistency shall be maintained by retempering with cool water. Do not retemper colored mortar to the degree that variations in color are apparent in the completed masonry.
      4) Mortar shall be used within 2 hours of initial mixing.
   b. Special conditions. When the ambient temperature exceeds 115 deg F (46 deg C), or exceeds 105 deg F (40 deg C) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition cool mixing water used for mortar and grout. The use of ice shall be permitted in the mixing water prior to use. Ice shall not be permitted in the mixing water when added to the other mortar or grout materials.
4. Protection. When the mean daily temperature exceeds 100 deg F (38 deg C), or exceeds 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), newly constructed masonry shall be fog sprayed until damp at least three times a day until the masonry is three days old.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Where fire rated construction is indicated, provide units complying with UL requirements.

B. Load Bearing Units: ASTM C90.
   1. Average net area compressive strength of units, ASTM C140/C140M: At least 2,000 psi (14.8 MPa).
   2. Density Classification: Lightweight unless otherwise indicated.
   3. Aggregates:
      a. Lightweight Aggregates: Lightweight aggregate used shall strictly comply with ASTM C 331, ASTM C 151, and ASTM C 641. Drying shrinkage of aggregate shall not exceed 0.10 percent (%) at 100 days.
      b. Normal Weight Aggregates: ASTM C 33.
      c. Waste concrete, bottom ash, scoria, or aglite shall not be permitted.
   4. Hollow block.

C. Provide specially shaped units where required by project conditions, including but not limited to:
   1. Corner block: Square.
   2. At control joints: Sash block.
   3. Lintels.
   4. Bond beams.

D. Nominal Face Size: 8 inches (200 mm) by 16 inches (400 mm), unless otherwise indicated on the drawings.
   1. Nominal Thickness: As indicated on the drawings.

2.02 CONCRETE AND MASONRY LINTELS

A. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

2.03 CLAY OR CALCIUM SILICATE MASONRY UNITS

A. Clay Face Brick: ASTM C216.
   1. Average net area compressive strength of units, ASTM C67: At least 4,150 psi (28.6 MPa).
   2. Type FBX.
   3. Grade SW.

B. Calcium Silicate Face Brick: ASTM C73.
   1. Grade SW.

C. Products:
   1. Provide one of the following:
      a. Basis of Design: Arriscraft
         1) BR1: Linear Series Forged Steel, smooth faced finish.
         2) BR2: Linear Series Cedar Woods, smooth faced finish.
      b. Interstate
         1) BR1: Emperor Black Opal, smooth texture.
         2) BR2: Emperor Pewter, smooth texture.
      c. Belden
         1) BR1: Ambassador Graphite Black.
         2) BR2: Ambassador Smoky Gray.

D. Clay Face Brick Nominal Size: 4 inches (100 mm) by 16 inches (200 mm) by 2-2/3 inches (65 mm).

E. Calcium Silicate Face Brick Nominal Size: 4 inches (100 mm) by random lengths up to 24 inches (600 mm) by 2-2/3 inches (65 mm).

F. Provide specially extruded or molded units where specially shaped units are required by project conditions.
   1. Special shapes sawn from standard units will be permitted where the sawn face is not exposed to view or to weather.

G. Provide 100% solid units (no cores) in the following locations:

1. Wherever core holes would be exposed to view or to weather.
2. In courses where flashing will be placed directly on masonry.

2.04 MORTAR MATERIALS

A. Deliver cementitious materials to the job site in bags containing factory proportioned quantities of cement and lime in each bag according to the approved design mix, unless an alternate method of batching is approved by the Architect. Manufacturer's label on each bag shall clearly indicate compliance with this specification. Labels bearing the words “masonry cement” shall in addition bear the words “Portland-lime” or other clear indication of compliance with this specification.

B. Portland Cement: ASTM C150/C150M, Type I.
   1. For exposed masonry provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

C. Masonry Cement and Mortar Cement are not acceptable.

D. Hydrated Lime: ASTM C207, Type S.

E. Mortar Aggregate: ASTM C144.

F. Grout Aggregate: ASTM C404.

G. Pigments for Colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness and complying with ASTM C979/C979M.
   1. Mortar for masonry exposed to view, after curing the specified length of time, shall match the color of the sample on file in the office of the Architect.
   2. Note: Product name is for color matching, only, and does not indicate the type or brand of mortar to be furnished.

H. Water: Clean and potable.

I. Do not use antifreeze compounds, accelerators, water repellents, air-entraining admixtures, other admixtures, or products containing such materials.

2.05 REINFORCING AND ANCHORS

A. Reinforcing Steel:
   1. ASTM A615/A615M, Grade 60, deformed, plain finish.

B. The manufacturers specified herein have standard or made-to-order veneer anchors of sufficient strength to meet the Project requirements. Provide anchor thickness/gauge as necessary to meet the required loads but in no case less than that specified below. For veneer anchors used in cavities larger than 4.5 inches (115 mm), make arrangements with the veneer anchor manufacturer to provide anchors of the type specified and of the necessary thickness and strength to comply with the requirements of the Building Code / TMS 402/602, and submit design data bearing the seal of a professional engineer licensed to practice in the State in which the Project is located.

C. For the materials below, provide products of one of the following:
   1. Blok-Lok.
   2. Heckmann.
   3. Hohmann & Barnard (H & B).

D. For the joint reinforcing and anchoring products below, provide the following material:
   1. Exterior walls (all wythes):
      a. Stainless steel ASTM A580/A580M, Type 304.
   2. Interior walls and partitions:
      a. Hot dip galvanized ASTM A153/A153M.

E. Bar Positioners:
   1. Blok-Lok.
   2. Heckmann 376, 377, 378.
   3. H & B #RB, #RB-Twin.

F. Joint Reinforcement: ASTM A951/A951M.

1. Side wire size: W1.7 (No. 9).
2. Cross wire size: W1.7 (No.9).
3. Configurations:
   a. Single Wythe CMU:
      1) Ladder type, 1 side rod per face shell; between 5/8 inch (16 mm) and 1 inch (25 mm) mortar coverage at each face.
      2) Blok-Lok BL-10.
      3) Heckmann "1100 Series".
      4) H & B "#220 Ladder-Mesh"
   b. CMU backup for clay or shale brick veneer:
      1) Ladder type, 1 side rod per face shell; between 5/8 inch (16 mm) and 1 inch (25 mm) mortar coverage at each face.
      2) Adjustable veneer anchors, wire size W2.8 embedded into veneer at least 1-1/2 inch (40 mm) and extending not closer than 5/8 inch (16 mm) from the exposed face.
      3) Blok-Lok Blok-Lok "Adjustable Econo-Cavity Lok II BL42" with "Wedge-Lok" insulation retainers.
      4) H & B "Lox-All Ladder Type #270".

G. Anchoring CMU to Structural Frame:
   1. Anchoring CMU to Cast-In-Place Concrete:
      a. Anchors for CMU: 3/16 inch (5 mm) dia. triangular wire ties or 1/8 inch (3 mm) thick strap anchor.
         1) Blok-Lok "BL-305, BLT-8 plus Flex-O-Lok".
         2) Heckmann "#100 plus #103".
         3) H & B "#305 plus #315".
   2. Anchoring CMU over Waterproofed Cast-In-Place Concrete:
      a. Blok-Lok BL-5407.
      b. Heckmann #213 plus #282.
      c. H & B HB #213.
   3. Anchoring Masonry to Steel Frame:
      a. Weld-on Anchor to Steel: 1/8 inch (3 mm)-thick bent steel sheet, with slot to receive tie. Tie for CMU: 3/16 inch (5 mm) dia. triangular wire tie.
         1) Blok-Lok
         2) Heckmann #308 plus #318.
         3) H & B

H. Masonry Veneer Anchors:
   1. Sized for embedment into veneer at least 1-1/2 inch (40 mm) and extending not closer than 5/8 inch (16 mm) from the exposed face.
   2. Clearance between tie and base parts: Not more than 1/16 inch (2 mm).
   3. Over stud or concrete back-up: Single screw anchor with two-leg anchor.
      a. Blok-Lok Thermal Concrete 2-Seal Wing Nut Anchor (CMU, concrete backup); Thermal 2-Seal Wing Nut Anchor (steel stud backup).
      b. Heckmann #75TC Pos-I-Tie ThermalClip with CI Washer.
      c. H & B Thermal Concrete 2-Seal Wing Nut Anchor (CMU, concrete backup); Thermal 2-Seal Wing Nut Anchor (steel stud backup).
   4. Over CMU back-up: Joint reinforcement with adjustable ties (specified above).
   5. Over CMU or cast-in-place concrete where necessary to comply with spacing requirements:
      a. Blok-Lok BL-5407.
      b. Heckmann #213 plus #282.
      c. H & B HB-213.
   6. Fasteners for anchors over masonry and cast-in-place concrete: Brass or Type 304 stainless steel expansion bolts provided by anchor manufacturer.

7. Self-Adhesive Sheet Membrane for use under veneer anchors installed on sheathing and stud back-up:
   a. Self-adhesive butyl sheet membrane specified in weather-resistant barrier Section in Division 07.

I. Insulation retainer clips:
1. Owens Corning Thermafiber RainBarrier Clip.
2. Blok-Lok Wedge-Lok.
3. Heckmann.
4. H & B #HB213 Washer.

2.06 FLASHINGS

A. Receivers and Counterflashing: Specified in Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Flashing Materials: Flexible, self-adhesive sheet membrane, as specified in Section 07 65 00 - Flexible Flashing.

2.07 ACCESSORIES

A. Control Joint Filler: Rubber shear key, width 1 inch (25 mm) nominal less than wythe.
1. Blok-Lok.
2. Heckman #352.
3. H & B #RS.

B. Expansion Joint Filler: Soft, closed cell neoprene rubber. Thickness 3/8 inch (10 mm) vertical joints, 1/4 inch (6 mm) horizontal joints. Depth equal to wythe less 3/8 inch (10 mm).
1. Blok-Lok.
2. Heckmann.
3. H & B #NS Closed-Cell Neoprene Sponge.

C. Weeps and Vents: UV resistant polypropylene.
1. Blok-Lok.
2. Heckmann #85 Cell Vent.
3. H & B #QV Quadro-Vent.

D. Confinement Mesh: Inert, non-corrosive mesh to confine grout while maintaining bond with mortar.
1. Blok-Lok.
2. Heckmann #267.
3. H & B #MGS-Mortar/Grout Screen.

2.08 MIXING

A. Mortar for Clay or Shale Unit Masonry: ASTM C270, proportion specification; Type N.

B. Mortar for Concrete Unit Masonry: ASTM C270, proportion specification; Type N unless otherwise indicated on the structural drawings.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio or that permitted by TMS 402/602.

D. Mixing Setting Mortar:
1. Use a paddle type mechanical batch mixer.
2. Use a positive means of measuring volumes of ingredients. Each batch shall contain a known volume of each ingredient. Measuring by shovels is not acceptable.
3. Mix batches using whole sacks of cementitious materials unless another method of equivalent accuracy is approved by the Architect.
4. Do not mix partial batches. Discard unused mix.
5. Use mortar as soon as possible.
6. Mortar that loses water by evaporation shall be retempered by the addition of water to restore its original consistency, providing the mortar has not begun to set.

7. Do not re-temper colored mortar to the degree that variations in color are apparent in the completed masonry.
8. Discard mortar that has begun to set.
9. Discard mortar that has not been used after 2-1/2 hours after original mixing.

E. Mixing order when lime and cement are bagged together (confirm with manufacturer and notify Architect if manufacturer's instructions differ):
1. Water: 75% of total.
2. Sand: Half.
3. Lime and cement: All.
4. Sand: The remainder.
5. Water: To a workable consistency.
6. Mix: Not less than 3-1/2 nor more than 5 minutes after the introduction of cementitious material.

F. Mixing order when lime and cement are bagged in two separate bags:
1. Water: 75% of total.
2. Sand: Half.
3. Lime: All.
4. Mix: 2 minutes.
5. Portland Cement: All.
6. Sand: The remainder.
7. Water: To a workable consistency.
8. Mix: 5 full minutes.

G. Grout: ASTM C476.
1. Compressive strength, ASTM C1019: As indicated on the structural drawings, or if not indicated, provide grout complying with the proportions of Table 1, ASTM C476.
2. Slump, ASTM C143/C143M: 8 inches (200 mm) to 11 inches (280 mm) inches.
3. Fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

H. Mixing Grout: Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

2.09 FABRICATION OF REINFORCING STEEL

A. Shop-fabricate reinforcing steel in compliance with TMS 402/602.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Verify that reinforcing dowels are properly positioned.
2. Verify that items to be built-in such as pipes, conduit, boxes, and other items are properly positioned and do not interfere with masonry or reinforcing.
3. Verify that non-masonry structural elements such as foundations for masonry, columns, beams, floor slab edges are properly positioned and do not interfere with masonry or required cavity.
4. Verity that field measurements of project conditions allow for proper coursing both vertically and horizontally, unless otherwise required by the contract documents. Notify the Architect of non-coursing conditions.

B. Ensure that as-built field tolerances of other trades will permit the proper construction of masonry.

C. Bearing and Cavity Width:
1. Do not allow clear air space behind veneer to be less than 1-1/2 inches (40 mm).
2. Do not allow clay or shale brick to bear on less than 2/3 of their actual width.
3. Do not allow hollow CMU to bear on less than their full width

D. Ensure that materials to be covered by masonry (such as steel studs, sheathing, insulation, membrane flashings, dampproofing, etc.) are complete and have been inspected and approved before covering with masonry.

E. As masonry construction progresses and before covering flashings with masonry, verify that flashings are properly located, sealed watertight, and constructed so as to direct water to the outside.

F. Where conditions are not compliant, notify the Architect before beginning masonry construction.

G. Provide corrected conditions before beginning masonry construction.

3.02 PREPARATION

A. Temporarily brace masonry until permanent bracing is provided.

B. Brace masonry in accordance with “Standard Practice for Bracing Masonry Walls Under Construction,” Council for Masonry Bracing.

C. Clean reinforcing steel when required by TMS 402/602.

3.03 PLACING UNITS

A. Solid units:
   1. Ensure bed and head joints are full of mortar without voids.
   2. Bevel bed joints with an appropriate quantity of mortar to fully fill the bed joint without overfilling, and without forcing excess mortar into the cavity or onto the face of units.
   3. Do not furrow bed joints.
   4. Place mortar on the head of the unit prior to placing, and shove into place.
   5. Do not slush head joints.

B. Hollow Units:
   1. Construct with fully mortared face shells.
   2. Construct fully mortared web joints:
      a. At the first course of bearing.
      b. All courses of columns, piers, and pilasters.
      c. Perimeter of grouted construction.

C. Ensure that units are in final position and adjusted to line, level, and plane before 60 seconds have expired since mortar contact with unit. Do not disturb units after this time. If further adjustment is required, remove unit and mortar and install fresh unit and mortar. Removed units may be reused if cleaned promptly and allowed to dry 24 hours before reuse.

D. Strike-off extruded mortar from the face and rear of the unit using a lifting and cutting motion of the trowel. Avoid dropping mortar in the cavity. Do not smear of mortar on the face of units.

3.04 COURSING AND JOINTING

A. Place units in running bond, unless otherwise indicated.
   1. Calcium silicate face brick: Random pattern with units up to 24 inches long and no less than 4 inches long. Mix shorter units from skid with longer units to maintain consistency of appearance. Random installation should consist of approximately 70 percent full length units.

B. Corners: calcium silicate face brick minimum 8 inch long units at corners. Offset vertical joints minimum 3 inches. Dress split end to match face when exposed in wall.

C. Do not tooth masonry. Rack masonry 1 unit per course where masonry is not laid continuously.

D. Joint thickness: 3/8 inches (10 mm). Construct joints of uniform thickness.
   1. Exception: Bed joint at foundations: Not less than 1/4 inches (6 mm) nor more than 3/4 inches (20 mm).
   2. Exception: Where stretching or compressing joints is necessary to accommodate dimensional tolerances or other conditions, consult with the Architect to determine acceptable tolerances.

E. Expansion Joints in Clay or Shale or Calcium Silicate Masonry:

1. Ensure that expansion joints are free of mortar and other obstructions.
2. Place compressible expansion joint filler at proper depth to receive joint sealant.
3. Install expansion joints where indicated on Drawings.

F. Control Joints in Concrete Masonry:
1. Construct control joints using sash block and control joint filler topped with joint sealant specified in Division 07.
2. Install control joints where indicated on Drawings and where recommended in NCMA TEK 10-2C.

G. Joint Shape:
1. Concave, unless otherwise indicated.
2. Raked joints at calcium silicate face brick.
3. Strike joint flush at the following:
a. To receive dampproofing or liquid weather-resistant barrier..

H. Openings: Construct masonry openings for windows, doors, and penetrations to allow for proper sealant joint width between masonry and other material.
1. Joint width adjacent to openings: 3/8 inch (10 mm) unless otherwise indicated on the drawings.

I. Where walls and partitions abut columns or other construction:
1. At fire-rated construction install firestopping specified in Division 07.

J. Where differing exterior masonry materials meet (brick, CMU, cast stone, precast concrete, cast-in-place concrete, etc.), rake back mortar to receive joint sealant specified in Division 07.

3.05 SPECIAL SHAPES

A. Cut units neatly where required. Do not use broken or chipped units.

B. Use special shapes where required.

C. Use 100% solid units (uncored) in the final course where flashings will be placed directly on masonry.

D. Do not place units such that core holes or raw edges are exposed to view or to weather.

3.06 VENEER

A. Install back-up wythe, dampproofing, weather-resistant barrier, control joint sealant, and sealant joints between back-up and abutting construction. Obtain the Architect’s approval before covering with veneer or other materials.

B. Before constructing veneer, verify that spacing of veneer anchors in back-up is as specified.

C. Where built-in items such as pipes, conduit, boxes, and other items occur, ensure that such items do not interfere with proper cavity drainage. If such occur, consult with the Architect and provide custom flashing or other measures as approved.

3.07 CLEANOUTS AND WEEPS

A. Clay or Shale Masonry: Provide cleanouts at each flashing elevation, spaced 24 inches (610 mm) on center. Clean out accumulated mortar droppings from the cavity before mortar hardens throughout each work day and at the end of each work day. Achieve a mortar-free cavity.

B. Obtain the Architect’s approval before permanently closing cleanouts.

C. Install weep devices at 24 inches (610 mm) on center.

D. Ensure that plastic weep device is seated on flashing - not held above flashing by mortar.

E. Three courses below flashings, install vent devices at 24 inches (610 mm) on center, offset 12 inches (300 mm) horizontally from weeps above.

3.08 REINFORCING STEEL

A. Secure reinforcing steel against displacement prior to grouting.

B. Locate vertical bar positioners at the following locations:
1. At the top of the first course.

2. One course below the top of wall or partition.
3. Not more than 4 feet (1.2 m) vertically between positioners.

C. Provide at least 1/4 inch (6 mm) fine grout cover or 1/2 inch (12 mm) coarse grout cover between steel and adjacent masonry unit or formed surface.

D. Placement tolerance: As specified in TMS 402/602.

E. Do not bend reinforcing on site or after placement without the Architect's approval.

3.09 GROUTING

A. Construct cleanouts in accordance with TMS 402/602.

B. Ensure that inside face of cells or cavities aligned, and unobstructed by interior offsets of more than 1/2 inch (12 mm).

C. Confine grout within intended spaces.

D. Place grout in accordance with TMS 402/602.

3.10 HORIZONTAL JOINT REINFORCEMENT IN CMU

A. Reinforce all CMU walls and partitions.

B. Lay joint reinforcement directly on masonry units and cover with mortar. Provide mortar cover specified in Part 2.

C. Lap joint reinforcement at least 6 inch (150 mm).

D. At corners and intersecting walls, install joint reinforcement with prefabricated corners and tees.

E. Vertical Spacing:
1. 16 inches (400 mm) on center, unless otherwise indicated.
2. Prefabricated units at corners and intersecting walls, 8 inches (200 mm) on center. Extend legs at least 30 inches (760 mm) in each direction.
3. First 2 courses above and below openings. Extend at least 16 inches (400 mm) beyond each side of opening.
4. First 2 courses below the tops of walls.
5. Parapets: 8 inches (200 mm) on center.

F. Do not continue horizontal joint reinforcement through control joints.

3.11 ANCHORING TO WATERPROOFED SUBSTRATE

A. Do not use dovetail slots.

B. Install mechanically fastened anchors.

C. Coordinate installation of anchors and waterproofing to ensure that each penetration is watertight.

3.12 ANCHORING CMU TO STRUCTURAL FRAME

A. Anchor CMU to structure as indicated on structural drawings.

3.13 VENEER ANCHORS

A. Where veneer is attached to sheathing and stud substrates, install self-adhesive sheet membrane at each location to receive a veneer anchor. Press entire surface area of sheet firmly against substrate using 4 inches (100 mm) to 6 inches (150 mm) wide steel hand roller. Continue pressing and rolling until entire sheet is well bonded to substrate. Place anchor on top of sheet membrane and fasten through to stud. Size sheet material to extend approximately 1/2 inch (13 mm) beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to form an air-tight and weather-tight seal. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic (product acceptable to the air barrier manufacturer) to form an air-tight and weather-tight seal.

B. Space anchors as follows:
1. Not more than 1.87 sf (0.17 sq.m) of wall area per anchor.
2. Not more than 18 inches (460 mm) vertically.

3. Not more than 18 inches (460 mm) horizontally.
4. Openings larger than 16 inches (400 mm) in either direction: Install additional anchors within 12 inches (300 mm) of opening, spaced at not more than 24 inches (610 mm) on center.
5. Locate the first row of anchors not more than 16 inches (400 mm) above bearing elevation.
6. Locate the last row of anchors not more than 8 inches (200 mm) below the top of masonry panel (top of parapet, top of wall, underside of structure, below shelf angle, etc.).
7. Where veneer corners are not masonry bonded (an expansion joint occurs at the corner), locate the first column of anchors within 12 inches (300 mm) of outside face of masonry in both directions.
8. Where veneer corners are masonry bonded (no expansion joint at the corner), locate the first column of anchors within 16 inches (400 mm) of the outside face of masonry in both directions.

C. Install adjustable anchors to allow for expansion of clay or shale masonry and contraction of back-up.

3.14 MASONRY FLASHING

A. Specified in Section 07 65 00 - Flexible Flashing.

3.15 OTHER MATERIALS

A. Build-in items specified elsewhere including, but not limited to:
1. Lintels.
2. Door frames. Fill hollow metal frames with grout.
3. Window frames.
4. Frames for openings.
5. Anchors for built-in items.
6. Inserts and connectors.
7. Utility items.

B. Simultaneously construct chases and contiguous walls or partitions.

C. Do not embed wood (whether or not preservative treated) or other organic materials.

D. Do not embed aluminum that has not been coated with an approved anti-corrosion coating.

3.16 TOLERANCES

A. Conform to both code and visual tolerances.

B. Code Tolerances: As specified in TMS 402/602.

C. Appearance of Completed Work: Variations in dimension, joint thickness, plumb, plane, line, alignment, offset, location in plan or elevation, etc., that are visible to the Architect under the criteria below shall be considered defective and shall, if ordered by the Architect, be corrected even though such conditions may fall within the tolerances specified in TMS 402/602.
1. The Architect will view the completed masonry to approve or reject the color consistency of the mortar, cleanliness of the masonry, and other aesthetic aspects of the work.
2. If the Contractor so requests, an initial determination will be made at not earlier than 2 weeks of age.
3. The Architect is the sole judge of aesthetic effect.
4. Initial approval will be given as a part of periodic site visits.
5. Final approval will be given only after scaffolding is removed and not earlier than 4 weeks after masonry has been laid.
6. Criteria for acceptance: Masonry shall be free of objectionable variations in color of the mortar, cleanliness of the new masonry, or other defective aesthetic effects. Lippage, or cocked or tilted masonry units are not acceptable.
7. Conditions for approval of completed appearance: Work will be viewed under normal daylight from a distance of 20 feet (6 m) (or more at the Architect's discretion), except in those areas where work occurs adjacent to entrances and walking surfaces, which will be viewed at close hand.

8. Variations from Code tolerances and defects that affect serviceability are not limited by viewing distance.

3.17 IN PROGRESS CLEANING

A. Arrange means, methods, and techniques of construction masonry and the work of other trades to avoid and prevent the soiling or staining of in-progress and completed masonry.

B. On-site Storage:
   1. Protect masonry units from soil and mud.
   2. Store units on pallets or equivalent to raise units above ground or place on well drained hard pavement. Do not place units directly on the ground.
   3. Cover units with tarps to keep out precipitation. Ventilate tarps at the base to allow air circulation and to avoid condensation.

C. Protection:
   1. Protect the base of masonry after the first course is laid. Use sand, straw, sawdust, plastic sheeting, etc., to prevent stains from mud and soil. Ensure proper drainage at base of wall to avoid retaining water and muddy conditions.
   2. Cover the top of masonry with waterproof coverings at the end of each work day. Covers shall drape vertically at least 6 inches (150 mm) down inside and outside face of masonry. Secure covers against blowing wind.
   3. Set scaffold far enough from the wall to allow mortar droppings to fall to the ground without staining completed masonry. At the end of each work day remove or tilt up scaffold board nearest the wall to dump mortar droppings and to prevent rainfall from splattering mortar from the board to newly constructed masonry.

D. Laying Masonry:
   1. After spreading bed joint mortar and before placing brick, cut mortar from the wall face with the edge of a trowel to prevent mortar running down the wall.
   2. After units are laid, cut off excess mortar, capturing it with the trowel so as not to allow excess to drop down the face of the wall.

E. After Completion:
   1. Do not allow other trades to stain or soil completed masonry. Provide protection to avoid staining or soiling.
   2. Keep mud protection at the base of masonry until permanent landscaping is completed and viable, effective groundcover is well established.

F. Tooling:
   1. Tool joints when they are thumbprint hard.
   2. Tool joints at about the same "age" from lift to lift of masonry, from section to section of masonry, from day to day, and from crew to crew.
   3. Tool joints with a consistent technique.
   4. Then cut off mortar tailings with a trowel and, using a medium soft hair bricklayer’s brush, brush mortar burrs and dust from the face of units.
   5. At the start of work each morning, remove any remaining excess mortar from the face of units with a wire brush.

G. Non-Compliance with any of the above provisions is defective workmanship and grounds for rejection.

3.18 FINAL CLEANING

A. Specified in Section 04 01 20 - Masonry Cleaning.

END OF SECTION

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Architectural cast stone, mortar set in masonry assemblies.

C. Units required are indicated on the drawings as "cast stone".

D. Water repellent.

E. Cleaner.

1.02 REFERENCES

A. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2019.

B. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

C. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

D. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.

E. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

1.03 SUBMITTALS

A. Manufacturer's Qualifications.

B. Product Data:
   1. Mix designs, including strength and absorption test results.
   2. Water repellent: Manufacturer's technical product data and recommendations for use.

C. Manufacturer's Instructions for Water Repellent: Detailed application instructions, including weather limitations, condition of substrates, surface preparation or cleaning, protection of adjacent surfaces, application of product, and cleaning of accidental over-spray and spills.

D. Samples:
   1. Verification Samples: Pieces of actual cast stone components not less than 12 inches (305 mm) square, illustrating range of color and texture to be anticipated in components furnished for the project.
   2. Water Repellent: Submit 16 inches (400 mm) square sample of cast stone to receive water repellent. Leave 1/3 of panel untreated, apply 1 coat of water repellent to 1/3 of panel, and apply 2 coats to remaining 1/3 of panel.

E. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

F. Test Reports for Water Repellent: Test sealant adhesion and compatibility using substrate, water repellent, and sealant materials identical to those used in the work.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A current producer member of the Cast Stone Institute or the Architectural Precast Association with a minimum of five years of experience in producing cast stone of the types required for project.

B. Mock-Up:
   1. Provide and install cast stone in mock-up specified in Section 01 43 40.
   2. Do not begin production of units without the Architect's approval of the mock-up.
   3. Construct mock-up independently of the building, as specified elsewhere. Mock-up may not remain as part of the completed work.
   4. Remove mock-up when authorized and dispose of debris.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

H. Water Repellent:
1. Deliver materials to the project site in manufacturer's unopened original containers.
2. Store materials in dry, well-ventilated space.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide units from manufacturer as specified under "Quality Assurance", above.

2.02 DESIGN REQUIREMENTS

A. Masonry Substrates: Design connections using dowels, anchors, and ties embedded into masonry and into cast stone units.

B. Design connections to provide field adjustment of position in three dimensions.

C. Connections shall neither penetrate nor conflict with flashings and other elements of the building’s weather envelope, unless the Contractor submits specific written request illustrating the proposed method of establishing the integrity of flashing and other elements of the building's weather envelope, and such request is approved by the Architect in writing.

D. Design connections to direct water which may intrude into cavity toward the exterior, not the interior, of the building.

2.03 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.

B. Color and Texture:
1. Match brick BR1 as selected in Section 04 20 00.

C. Remove cement film from exposed surfaces before packaging for shipment.

D. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
2. Unless otherwise indicated on drawings, provide:
a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

E. Fabrication:
1. Formwork: Fabricate, reinforce, and maintain forms so as to resist fabrication stresses and to result in finished units of precise size, accurate shape, and required finish.
2. Architectural Finish: Fabricate exposed faces of units to achieve finish as follows:

a. Fine-grained aggregate texture typical of natural stone. No bugholes or air voids permitted.
b. Fabricate units using zero-slump concrete and the Vibrant Dry Tamp (VDT) method where practicable. Employ wet-cast methods only where approved by the Architect.
c. Anchors: Coordinate anchor locations with other trades and project requirements.
d. Rod and tamp mixture to force mix into intimate contact with forms and to obtain required level and clarity of detail. Do not dislocate reinforcing or anchors or tie wires.
e. Identification: Mark units to identify pickup points and final orientation, corresponding to final shop drawings. Imprint fabrication date on each unit in a concealed location.

3. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
4. Unless otherwise indicated on drawings, provide:
   a. Wash or slope of 1:12 on exterior horizontal surfaces.
   b. Drips on projecting components, wherever possible.
   c. Raised fillets at back of sills and at ends to be built in.

2.04 MATERIALS

A. Concrete Materials:
   1. Portland Cement for Units: ASTM C150/C150M.
      a. For Units: Type I, white or gray as required to match Architect's sample.
   2. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone as necessary to obtain color and texture.
   3. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands as necessary to obtain color and texture.
   4. Pigments: ASTM C979/C979M, permanent, nonstaining, nonfading, mineral oxide pigments; do not use carbon black.
   5. Admixtures: ASTM C494/C494M. Not more than 0.1 percent of soluble chloride ions by weight of cement allowed.
   6. Water: Potable.

B. Connection Materials:
   1. Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
      a. Provide dowels and anchors for connection to masonry.
   2. Shelf Angles and Similar Structural Items: Type 304 stainless steel, of shapes and sizes as required for conditions.
   3. Fasteners: Type 304 stainless steel.

C. Mortar: Specified In Section 04 20 00.

D. Sealant: As specified in Section 07 90 00.

E. Water Repellent:
   1. Products: Composition: Alkylalkoxysilane in alcohol; minimum 40% alkylalkoxysilane. Provide one of the following:
      a. Chemprobe Coating Systems, a Division of Tnemec Company, Inc.; Dur A Pel 40: www.chemprobe.com.
      b. BASF; MasterProtect H 440 VT.
      c. Evonik Degussa Corporation; Chem-Trete 40 VOC: www.protectosil.com.

F. Cleaner: See Section 04 20 00.

2.05 WATER REPELLENT APPLICATION

A. Preparation:
   1. Clean substrate, removing substances deleterious to penetration or performance of water repellents.
   2. Moisture Content: Test cleaned substrates according to manufacturer's instructions before applying water repellents.

B. Application: Apply to units before installing units on the building. Comply with manufacturer's written application instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.

B. Mortar Set:
   1. Set cast stone components with mortar as specified in Section 04 20 00 .
   2. Drench cast stone components with clear, running water immediately before installation.
   3. Set units in a full bed of mortar unless otherwise detailed.
   4. Ensure that head joints are full of mortar and without voids, except where sealant joints are indicated.
   5. Fill dowel holes and anchors slots with mortar.

C. Joints: Make all joints 3/8 inch (9.5 mm), except as otherwise detailed.
   1. Rake mortar joints 3/4 inch (19 mm) for pointing. Scrub face of each stone to remove excess mortar before it sets.
   2. Point joints with mortar in layers 3/8 inch (9.5 mm) thick and tool to a slight concave profile.

D. Leave the following joints open for sealant:
   1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   2. Head joints in wash surfaces of sills, water tables, and similar projecting courses.
   3. Joints labeled "expansion joint" or "control joint".

E. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches (3 mm in 900 mm) or 1/4 of nominal joint width, whichever is less.

3.02 CLEANING AND PROTECTION

A. Do not install units that are damaged or fail to conform to project requirements. Remove any such units inadvertently installed, or that are damaged after installation, and replace with new.

B. If approved by Architect, limited patching of a limited number of units may be employed in lieu of replacement. Excessive damage, either in severity or in quantity, may be considered defective work by the Architect.
   1. Using mock-up cast stone units that have not been incorporated in the work, demonstrate patching techniques and results to be expected, and obtain the approval of the Architect prior to patching units already installed.
   2. Repairs shall not be discernible to the ordinary observer, as determined by the Architect, when viewed from a distance of 12 to 20 feet (3.6 to 6 m), except that repair to units used within 20 feet (6 m) of entranceways and similar locations subject to close contact shall not be discernible from a distance of 3 feet (0.9 m).
   3. Spalls: Chip out spalled area to a depth of at least 1/2 inch (13 mm) using stone mason's chisel. Create a reasonable smooth, squared edge profile. Over a fully wetted (saturated, surface-dry) substrate, scrub a thick cream consistency slurry of portland cement, fine aggregate, and water and immediately apply patching material composed of the same aggregates, cements, and pigments used in the cast stone units, adjusted as necessary for use as a patching material. Do not use polymer bonding agents or admixtures. Where original materials employed in plant fabrication are not suitable as patching materials, replace or repair units as directed by the Architect.
   4. Cracks: Inject cracks as directed by the Architect.

C. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet (6 m).
   1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.

D. Clean cast stone components as work progresses; remove mortar fins and smears before tooling joints.

E. Clean cast stone as specified in Section 04 20 00 - Unit Masonry Assemblies.

F. Protect from splashing by mortar and other damage.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Shear stud connectors.
   3. Shrinkage-resistant grout.

1.02 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference

1.05 ACTION SUBMITTALS

A. Product Data:
   1. Structural-steel materials.
   2. High-strength, bolt-nut-washer assemblies.
   3. Shear stud connectors.
   4. Anchor rods.
   5. Threaded rods.
   6. Forged-steel hardware.
   7. Slide bearings.
   8. Prefabricated building columns.
   9. Shop primer.
   10. Galvanized-steel primer.
   11. Etching cleaner.
   12. Galvanized repair paint.
   13. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   5. Identify members and connections of the seismic-load-resisting system.
   6. Indicate locations and dimensions of protected zones.
   7. Identify demand-critical welds.
   8. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation. In addition, the professional engineer responsible for connection design shall review the shop drawings prior to submittal to verify that the connections detailed comply with the calculations provided as well as the design requirements. A review letter, signed and sealed by the professional engineer responsible for connection design, shall be provided with the shop drawings and calculations submittal stating that this review and verification has been completed.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:
1. ANSI/AISC 303.
2. ANSI/AISC 360.

B. Connection Design Information:
1. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: Type FR, fully restrained.
D. Construction: Braced frame.

2.02 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: As indicated.

B. Channels, Angles: As indicated.

C. Plate and Bar: As indicated.

D. Cold-Formed Hollow Structural Sections: As indicated.

E. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1, compressible-washer type with plain finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Plain.

D. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.04 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 36 or ASTM F1554, Grade 55, weldable, straight.
1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

B. Threaded Rods: ASTM A36/A36M.
1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

2.05 PRIMER

A. Steel Primer:
1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.
1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: ASTM A780/A780M.

2.06 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.07 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

2.08 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
   1. Joint Type: As indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces unless indicated to be painted.
   6. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
   1. SSPC-SP 2.
   2. SSPC-SP 3.
   3. SSPC-SP 7 (WAB)/NACE WAB-4.
   4. SSPC-SP 14 (WAB)/NACE WAB-8.

5. SSPC-SP 11.
6. SSPC-SP 6 (WAB)/NACE WAB-3.
7. SSPC-SP 10 (WAB)/NACE WAB-2.
8. SSPC-SP 5 (WAB)/NACE WAB-1.
9. SSPC-SP 8.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165/E165M.
b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in

intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened, Pretensioned, and Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.05 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.06 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting." Section 09 91 23 "Interior Painting." Section 09 96 00 "High-Performance Coatings."

C. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00 "High-Performance Coatings."

3.07 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

    a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

        1) Liquid Penetrant Inspection: ASTM E165/E165M.
        2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
        3) Ultrasonic Inspection: ASTM E164.
        4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 05 12 13 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes requirements regarding the fabrication, erection, surface preparation, and appearance of Architecturally Exposed Structural Steel (AESS).

B. This Section applies to members noted on the Drawings as AESS.

C. The requirements of this Section are in addition to those specified elsewhere in Division 05 for structural steel and other steel fabrications.

1.02 REFERENCES

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. AGA Guidelines - "The Design of Products to be Hot-Dip Galvanized After Fabrication," and "Recommended Details for Galvanized Structures"; American Galvanizers Association; undated; on file in Architect's office.

E. ASTM A 385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip); 2008.

1.03 SUBMITTALS

A. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, and other information specified.

B. Shop Drawings detailing fabrication of AESS components.
   1. Provide erection drawings clearly indicating which members are considered as AESS members.
   2. Include details that clearly identify all of the requirements listed in the Articles titled "Fabrication" and "Erection" of this specification. Provide connections for exposed AESS consistent with concepts shown on the architectural and structural drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
   4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate to which direction bolt heads should be oriented.
   5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
   6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.

1.04 QUALITY ASSURANCE

A. Comply with applicable provisions of the following specifications and documents:
   1. AISC Code of Standard Practice, latest edition, Section 10, and additional requirements as specified herein.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

B. Transport, store, and erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames.

C. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting.

D. Prior to erection, obtain the Architect's approval of methods of removing temporary erection devices and finishing the AESS members.

1.06 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.07 COORDINATION

A. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and direction for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Meet requirements Division 05 Section "Structural Steel" as amended below.
   1. Select steel for smooth, uniform appearance.

B. High-Strength Bolts, Nuts, and Washers: Per Section 05 12 00 heavy hex heads and nuts.
   1. Finish for Galvanized Fabrications: Galvanized per ASTM A153/A153M.

2.02 FABRICATION

A. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect. Detail AESS assemblies to minimize field handling and expedite erection.

B. Fabricate AESS with exposed surfaces smooth, square, and of surface quality consistent with the approved mock-up.

C. Use special care in handling and shipping of AESS both before and after shop painting.

D. In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.
   1. Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the Code of Standard Practice section 10.
   2. Welds ground smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within + 1/16 inch (+ 1.6 mm), - 0 inch (- 0 mm) of plate thickness.
   3. Contouring and blending of welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.
   4. Continuous Welds: Where welding is noted on the drawings, provide continuous welds of a uniform size and profile.
   5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
   6. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.
   7. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the

web or stem and of outstanding flanges or legs of angles shall be visibly acceptable to the Architect from a distance of 20 feet (6 m) under any lighting condition determined by the Architect. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension +/- 1/2 inch (+/- 13 mm).

8. Seal weld open ends of round and rectangular hollow structural section with 3/8 inch (10 mm) closure plates. Cope closure plate to match perimeter of member. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

2.03 SHOP CONNECTIONS

A. Weld Connections: Appearance and quality of welds shall be consistent with the mock up. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this Section.

B. Galvanized Members: Fabricate such that all connections of assemblies are made in the field with bolted connections. Field fabrication (including cutting and welding) of galvanized steel is not permitted.

2.04 FINISHING

A. AESS Scheduled to be Coated with Epoxy or Urethane Coatings:
   1. Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits.
   2. Provide degree of surface preparation according to SSPC Specifications as required by Section 09 96 00.
   3. Provide coating products as specified in Section 09 96 00.

2.05 SHOP PRIMING

A. Shop prime steel surfaces, except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).

B. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness specified. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.06 GALVANIZING

A. Hot-Dip Galvanize After Fabrication, ASTM A123/A123M: All exterior AESS.

B. Fabrication after galvanizing, including welding, cutting, fitting, drilling, etc., is not permitted.
   1. Detail, fabricate, and galvanize fabrications in accordance with recommendations of ASTM A 385.
   2. Detailing shall comply with recommendations in accordance with referenced AGA Guidelines.
      a. Class I details are required unless otherwise indicated or approved.
      b. Class II details are permitted only where indicated or approved.
      c. Class III details are not permitted.
   3. Fill exposed vent and drain holes, other than weep holes, with zinc solder and finish smooth.
   4. Detail members for bolted connections or for setting in concrete.
   5. Provide continuous seal welds. Intermittent welds are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

A. Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION

A. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. In addition to the special care used to handle and erect AESS, employ the following erection techniques:
   1. AESS Erection Tolerances: Erection Tolerances shall meet the requirements of Chapter 10 of the AISC "Code of Standard Practice".
   2. Welds ground smooth: Erector shall grind welds smooth in the connections of AESS members. For groove welds, the weld shall be made flush to the surfaces each side and be within + 1/16 inch (+ 1.6 mm), - 0 inch (- 0 mm) of plate thickness.
   3. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and match profile on approved mock-up.
   4. Continuous welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
   5. Minimize weld show through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
   6. Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up, and welding in the field shall be removed from the structure. Field groove welds shall be selected to eliminate the need for backing bars or to permit their removal after welding. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth.
   7. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled. Filling shall be executed with proper procedures to minimize restraint and address thermal stresses in group 4 and 5 shapes.

C. Field Welding: Weld profile, quality, and finish shall be consistent with mock-ups approved prior to fabrication.

D. Splice members only where indicated.

E. Torch cutting or field fabrication is not permitted without written permission from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.

F. Unfair holes:
   1. Do not enlarge unfair holes in members by burning or by using drift pins.
   2. Ream holes that must be enlarged to admit bolts.
   3. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

4. Galvanized fabrications: Correct galvanized surface prior to completing connection.

G. Field Welding, Cutting, Fitting, or other Alteration of Galvanized Fabrications: Not permitted. Provide refabricated and refinished material or new material.

3.04 FIELD CONNECTIONS

A. Welded Connections:
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.
2. Obtain Architect's approval for appearance of welds in repaired or field modified work.

B. Bolt head orientation: Orient bolt heads as indicated on the contract documents. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.

3.05 FIELD QUALITY CONTROL

A. Structural requirements: Refer to other Division 05 sections for inspection requirements.

B. AESS acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the mock-up. The Testing Agency shall have no responsibility for enforcing the requirements of this Section.

3.06 ADJUSTING AND CLEANING

A. Touch-up Painting: Clean and touch-up paint of field welds, bolted connections, and abraded areas of shop paint so as to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with Section 09 96 00.

3.07 REPAIR OF GALVANIZED SURFACES:

A. When approved by the Architect, touch-up minor and inadvertent damage to coatings with low-melting point solder per ASTM A780/A780M. Touch up with paints containing zinc dust is unacceptable.

B. Damage which is excessive: Remove damaged members, and provide new material.

END OF SECTION

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

1.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Roof deck.
2. Composite floor deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Research Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 40, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G90 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
3. Profile Depth: 2 inches.
4. Design Uncoated-Steel Thickness: 0.0295 inch.
5. Span Condition: Triple span or more.

2.04 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.
G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
H. Galvanizing Repair Paint: ASTM A780/A780M.
I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.

2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.04 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.

2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.

3. Weld Spacing: Space and locate welds as indicated.

4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation,and apply repair paint.

2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Ceiling joist framing.
4. Soffit framing.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference

1.03 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Vertical deflection clips.
5. Single deflection track.
6. Double deflection track.
7. Drift clips.
8. Ceiling joist framing.
9. Soffit framing.
10. Post-installed anchors.
11. Power-actuated anchors.
12. Sill sealer gasket.
13. Sill sealer gasket/termite barrier.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
   b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft..
   c. Ceiling Joist Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.02 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G90 or equivalent.

B. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1.
2. Coating: G90.

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus twice the design gap for other applications.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.04 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-1/4 inches.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

2.05 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.06 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.07 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.08 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.09 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

F. Sill Sealer Gasket/Termite Barrier: Minimum 68-mil nominal thickness, self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Physical Properties:

a. Peel Adhesion: 17.0 lb/in of width when tested in accordance with ASTM D412.
b. Low-Temperature Flexibility: Pass at minus 25 deg FASTM D146/D146M.
c. Water Vapor Permeance: 0.05 perm maximum when tested in accordance with ASTM E96/E96M, Method B.
d. Resistance to Termite Penetration: Comply with ICC-ES AC380.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

E. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.04 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 60 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Backing Strip: Install backing strip behind termination bars for flexible flashing, as indicated in section 07 65 00.

H. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.06 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Field and shop welds will be subject to testing and inspecting.
C. Testing agency will report test results promptly and in writing to Contractor and Architect.
D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.08 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 43 00 - SLOTTED CHANNEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Channel Framing System: To support mechanical, electrical, plumbing systems and laboratory equipment supported from deck or structural steel above.

1.02 REFERENCES

A. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades; 2018.

D. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality; 2017.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

F. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).

G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

1.03 QUALITY ASSURANCE

A. Manufacturer’s Qualifications
   1. The manufacturer shall not have had less than 10 year’s experience in manufacturing channel framing systems.
   2. All channel framing system components must be supplied by a single manufacturer.

1.04 SUBMITTALS

A. Product Data: Framing and connectors.

B. Delegated Design
   1. Structural Calculations and Shop Drawings.
      a. Submit structural calculations of channel framing system. Calculations shall include:
         1) Description of design criteria.
         2) Stress and deflection analysis.
         3) Selection of channel framing members, fittings, and accessories.
         4) Submit all shop/assembly drawings necessary to completely install the channel framing system in compliance with the Contract Drawings.
         5) Show loads of supported items. Where loading is not contained in the contract documents, obtain loading from the providers of such items.
         6) Show reactions at locations where building structure supports channel framing system.
         7) Submit all pertinent manufacturers published data.
         8) Calculations and shop drawings shall be sealed by a professional engineer licensed to practice in the state in which the project is located.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. One of the following:
   1. Unistrut Corporation; Product: Unistrut Metal Framing System; www.unistrut.com
   2. Cooper B-Line, Inc.; Product: BK Channel System; www.b-line.com

3. Flex-Strut, Inc.; Product: Flex-Strut Channel System; www.flexstrut.com.

2.02 MATERIALS

A. Channel members: Fabricated from structural grade steel conforming to one of the following specifications: ASTM A1011/A1011M SS Grade 33 or ASTM A653/A653M GR33.

B. Fittings: Fabricated from steel conforming to one of the following specifications: ASTM A36/A36M, ASTM A575, or ASTM A576.

2.03 FINISHES

A. Channel framing systems components shall be finished in accordance with one of the following standards:
   1. Rust inhibiting paint applied by electro-deposition. Finish to withstand minimum 400 hours salt spray when tested in accordance with ASTM B177/B177M.

B. Fittings components shall be finished in accordance with one of the following standards:
   1. Rust inhibiting paint applied by electro-deposition. Finish to withstand minimum 400 hours salt spray when tested in accordance with ASTM B177/B177M.
   2. Electrolytically zinc coated per ASTM B633.

C. Bolts and nuts shall be electrolytically zinc coated per ASTM B633 Type III SC 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. The installer shall inspect the work area prior to installation. If work area conditions are unsatisfactory, installation shall not proceed until satisfactory corrections are completed.

3.02 INSTALLATION

A. Set channel framing system components into final position true to line, level and plumb, in accordance with approved shop drawings.

B. Anchor material firmly in place. Tighten all connection to their recommended torques.

3.03 CLEANUP

A. Upon completion of this section of work, remove all protective wraps all debris. Repair any damage due to installation of this section of work.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

F. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.03 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Stainless Steel, General: ASTM A666, Type 304.

C. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

2.02 MATERIALS - ALUMINUM

A. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Lintels: As scheduled; stainless steel.

B. Curtain wall head and jamb trim: As detailed; aluminum plate.

C. Biopharma pipe penetration discs: As indicated in Drawings.

2.05 FINISHES - STEEL

A. Prepare surfaces to be primed in accordance with SSPC-SP2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

2.06 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: superior performance organic coating.

B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; custom color to match approved sample.
   1. Color: Custom color as selected by Architect.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 05 51 00 - METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with precast terrazzo treads and risers.

C. Structural steel stair framing and supports.

D. Handrails and guards.

1.02 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2021.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2021).

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

N. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.03 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

B. Delegated Design Data: As required by authorities having jurisdiction. Delegated design data to be sealed and signed by design engineer.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies that comply with the following:
      a. Stair Capacity: Uniform live load of 100 lb/sq ft (4.7 kPa) and a concentrated load of 300 lb (14.4 kg) with deflection of stringer or landing framing not to exceed 1/360 of span.
      b. Railing Assemblies: Comply with applicable local code.
   4. Dimensions: As indicated on drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
   4. Concrete Reinforcement: Welded wire mesh.
   5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
   2. Nosing Depth: Not more than 1-1/2 inch (38 mm) overhang.
   3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 10 inches (250 mm).
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Railings: Steel picket railings.

G. Finish: Shop- or factory-prime painted.

H. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 METAL STAIRS WITH PRECAST TERRAZZO TREADS AND RISERS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Treads and Risers: as specified in Section 09 66 23.

C. Treads: Metal pan with precast terrazzo tread and riser.
   1. Tread Pan Material: Steel sheet.
   2. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
   3. Pan Anchorage to Stringers: Continuously welded, from top or bottom.

D. Risers: Same material and thickness as treads.

E. Stringers: Hollow steel sections.
   1. Stringer Depth: 12 inches (305 mm).
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel picket railings as indicated in Drawings.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 HANDRAILS AND GUARDS

A. Handrails: As specified in Section 05 52 13.

B. Guards:
   1. Top and Bottom Rails: Steel bar stock, 3 inch (76 mm) by 3/4 inch (19 mm).
   2. Infill at Picket Railings: Vertical pickets.
      a. Horizontal Spacing: Maximum 4 1/2 inches (115 mm) on center.
      b. Material: Solid steel bar.
      c. Shape: Square.
      d. Size: 3/4 inch (19 mm) square.
      e. Top Mounting: Welded to underside of top rail.
      f. Bottom Mounting: Welded to top of bottom rail.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.05 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Concrete Fill: See Section 03 30 00.

F. Concrete Reinforcement: Mesh type, galvanized.

2.06 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 51 33 - METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Prefabricated ship ladders.

1.02 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2021).

G. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

I. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.03 SUBMITTALS

A. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.04 QUALITY ASSURANCE

A. Design ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Bolts, Nuts, and Washers: Stainless steel.

C. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; galvanized finish.
   1. Side Rails: 3/8 by 5 inches (9 by 125 mm) members spaced at 16 inches (405 mm).
   2. Rungs: 3/4 inch (19 mm) diameter solid round bar spaced 12 inches (300 mm) maximum on center.
   3. Space rungs 7 inches (175 mm) from wall surface.

2.05 PREFABRICATED LADDERS

A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. General: Comply with all requirements of North Carolina Building Code for ship ladders.
   2. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with code and with the requirements of the MATERIALS article of this section.
   3. Materials: Aluminum; ASTM B211/B211M, 6063 alloy, T52 temper.
   4. Incline: 60 degrees.
   5. Treads: minimum depth 5 inches (125 mm).
   6. Handrails: Continuous gripping surface without interruption by brackets.
   7. Finish: Mill finish aluminum.

2.06 FINISHES - STEEL

A. Prepare surfaces to be primed in accordance with SSPC-SP2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stainless steel pipe handrails and fittings.

B. Wall mounted railings.

1.02 REFERENCES

A. ASTM A312/A312M - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes; 2022.

B. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

C. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

1.03 SUBMITTALS

A. Product Data.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Delegated Design Data: As required by authorities having jurisdiction. Delegated design data to be sealed and signed by design engineer.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 STAINLESS STEEL RAILING SYSTEM

A. Pipe: ASTM A312/A312M, Schedule 40, Grade TP304.
   1. Select pipe for smooth, uniform appearance.
   2. Size: NPS 1-1/4 inch (1.660 O.D.).

B. Corners Fittings: Commercial standard flush type rail fittings, welded and ground smooth.
   1. Manufacturers:
      a. Basis of Design: Model numbers for 1-1/4 inch (32 mm) and 1-1/2 inch (38 mm) pipe are by Julius Blum & Co., Inc.
      b. Other acceptable manufacturers:
         1) J.G. Braun.
         2) T&B Wagner, Inc.
   2. 90 degree elbows: #225, 226.
   3. Wall returns: #215-F, 216-F, 212.
   4. Pipe splice locks: #287, 288.
   5. Round slip flange: #210, 211.
   6. Connectors: #292, 293.
   7. Drive-on caps: #277, 278.
   8. Other fittings: As required by project conditions.
   9. Tees and crosses: Cope and weld pipe.

C. Wall Brackets: #218 for 2-1/2 inch (64 mm) projection, #220 for 3 inch (76 mm) projection.

2.02 FASTENERS AND ANCHORS

A. Material: Same as railing being fastened.

B. Type and style: Suitable for substrate.

C. Posts set in concrete:
   1. Galvanized steel pipe sleeves: I.D. shall be 3/4 inch (19 mm) larger than post O.D.; 5-1/2 inches (140 mm) typical. Steel plate bottom closure. Embed sleeves in concrete.
   2. Nonshrink grout: Factory packaged, nonmetallic; ASTM C1107/C1107M.

D. Steel Stud Walls: Install continuous, channel shaped blocking between studs. 6 inches x 1-1/4 inch (150 mm x 32 mm) x 16 gauge, 0.051 inch (1.3 mm), notched to fit stud spacing (Metal Lite Inc. 800-933-6382). Secure blocking to each stud with 3 #10 screws.

2.03 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

C. Rail Ends:
   1. Return rail ends to wall with wall returns.
   2. Where straight rail runs are interrupted by columns, pilasters, walls, etc. terminate rail ends with pipe flanges anchored to wall.
   3. Where freestanding rail ends occur, close with weld-on caps.

D. Join posts, rails, and corners with one of the following methods:
   1. Standard commercial corner fittings, coped tees and crosses. Weld and grind smooth.
   2. Mitered corner fittings, coped tees and crosses. Weld and grind smooth.
   3. Bend corners using suitable jigs so as not to crush pipe. Cope tees and crosses, and weld and grind smooth.

E. Expansion: Where railings are continuous, locate expansion joints (pipe splice locks) as indicated on the drawing, or if not indicated, at not more than 40 feet (12.20 m) o.c. for interior rails and 25 feet (7.6 m) o.c. for exterior rails, positioned 6 inches (150 mm) from posts.

F. Detail, fabricate, and dress railings to produce neat, attractive, smooth, uniform finishes that are free of surface irregularities, roughness, texture, variations in appearance, or other defects.

G. Exterior rails: Provide weep holes near base of posts.

H. Provide anchors and plates required for connecting railings to structure.

I. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

J. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

K. Accurately form components to suit specific project conditions and for proper connection to building structure.

2.04 FINISHES

A. Stainless Steel Railings: NAAMM AMP 500-06 No. 4 finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Install sleeves in concrete formwork prior to placing concrete.
   1. Fill annular space between sleeves and posts with nonshrink grout, flush with surface.
   2. Apply a fillet of sealant (specified in Section 07 92 00) between floor and post.

3. Conceal grout and sealant with flange fitting.

D. Anchor railings securely to structure.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.03 ERECTION TOLERANCES

A. Install posts plumb within 1/16 inch (1.6 mm) in 3 feet (0.9 m), and aligned horizontally with floors and pitch of steps within 1/4 inch (6 mm) in 12 feet (3.6 m).

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.04 CLEANING AND PROTECTION

A. Stainless Steel: Clean and polish.

B. Correct minor damage to railings so that repairs are not visible. Where repairs are visible, remove and provide refabricated and refinished or new material.

END OF SECTION

SECTION 05 70 00 - DECORATIVE METAL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Custom metal wall panels.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCE STANDARDS

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

1.03 SUBMITTALS

A. Shop Drawings: Indicate wall panel elevations and sections, dimensions, sizes, connection attachments, fabrication details, and accessories.

B. Samples: Submit three of each item below for each type and condition shown.
   1. Custom metal wall panels: 6 inch by 6 inch (152 mm by 152 mm) sample illustrating finish.

PART 2 PRODUCTS

2.01 CUSTOM METAL WALL PANELS (MWP)

A. Products
   1. Basis of Design: Southeastern Architectural Systems (SEAS); Patina Carbon Steel Wall Panel, powder coat sealant.
   2. Brandner Design; Blackened Hot Rolled Steel, acrylic matte sealer.
   3. Zahner Surfaces; Oscura Blackened Steel.

B. Provide custom fabricated steel wall panels per details shown on drawings.

2.02 ACCESSORIES

A. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete for bolt anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry for bolt anchors.
   3. For anchorage to stud walls, provide backing plates for bolt anchors.
   4. Exposed Fasteners: No exposed bolts or screws.

B. Carbon Steel Bolts and Nuts: ASTM A307.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.03 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing nailers and curbs.

B. Telephone and electrical panel backers.

C. Plywood blocking at wall-mounted displays.

D. Preservative treatment of wood.

E. Fire retardant treatment of wood.

1.02 REFERENCES

A. APA E30 - Engineered Wood Construction Guide; 2019.

B. APA PRP-108 - Performance Standards and Qualification Policy for Wood Structural Panels (Form E445); 2021.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2021.

F. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.03 SUBMITTALS

A. Product Data.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect wood products against moisture and dimensional changes. Support stacks at several uniformly spaced points to prevent deformation. Store stacks raised above ground. Cover to protect from rain and snow. Select and arrange cover to allow air circulation under and all around stacks to prevent condensation. Maintain and restore displaced coverings. Remove from the site any wood products that have been subjected to moisture or that do not comply with the specified moisture requirements.

PART 2 PRODUCTS

2.01 WOOD PRODUCTS

A. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.

B. Grade Stamps for Concealed Lumber: Each piece of lumber, applied by inspection agency and showing compliance with each specified requirement.

C. Marking of Treated Wood: Each piece of lumber or plywood, applied by inspection agency, and showing compliance with specified standards.

2.02 DIMENSION LUMBER

A. Size: Provide nominal sizes indicated, complying with PS 20 except where actual sizes are specifically required.

B. Miscellaneous Lumber:
   1. Moisture content: 15 percent maximum (kiln-dry).
   2. Lumber: S4S, No. 2 or standard grade.
   3. Boards: Construction, 2 common, or No. 2 grade.

2.03 CONSTRUCTION PANELS

A. Construction Panels: Comply with APA PRP-108 where APA rated panels are specified; bearing APA trademark showing compliance with each specified requirement.

B. Miscellaneous Panels:
   1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
   2. Telephone and Electrical Panel Backers: PS 1, APA rated sheathing, Exposure 1, A-D faces, Treating Grade; fire retardant treated.

C. Panel Thickness: As indicated on the Drawings.
   1. Nominal Dimensions: Where nominal thicknesses are indicated, provide actual thickness as follows, providing other project requirements such as grade, span rating, and exposure are met:
      a. 7/16 inch (11 mm) nominal: 7/16 inch (11 mm) actual.
      b. 1/2 inch (13 mm) nominal: 15/32 inch (12 mm), or 1/2 inch (13 mm) actual.
      c. 5/8 inch (16 mm) nominal: 19/32 inch (15 mm), 5/8 inch (16 mm), or 21/32 inch (17 mm) actual.
      d. 3/4 inch (19 mm) nominal: 11/16 inch (18 mm) or 3/4 inch (19 mm) actual.
      e. 1 inch (25 mm) nominal: 1 inch (25 mm) actual.
      f. 1-1/8 inch (30 mm) nominal: 1-1/8 inch (30 mm) actual.
      g. 1-1/4 inch (32 mm) nominal: 1-1/4 inch (32 mm) actual.

2.04 WOOD TREATMENT

A. Treat all lumber and all construction panels used in building construction unless untreated material is explicitly specified by the use of the words "fire retardant or preservative treatment is not required" or similar language.
   1. Except where required to be untreated, all lumber and all construction panels used in building construction shall be fire retardant treated, except pressure preservative treated lumber and construction panels not required to be fire retardant treated.
   2. Furniture, furnishings, finish carpentry, and architectural woodwork are not specified in this Section and are subject to treatment requirements, if any, specified in their respective Specification Sections.

B. Fire Retardant Treatment: Treat wood used in the locations described below. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 18 percent for plywood. Provide wood treated according to AWPA U1 with Use Category (UC) suitable for actual service encountered on the Project. Provide product with factory-applied colored dye to readily identify the material on site.
   1. Fire Retardant Interior (UCFA): Low hygroscopic.
      a. Lonza Wood Protection; “Dricon Fire Retardant Treated (FRT)" wood.
         1) Interior uses.
         2) Exterior walls (protected from direct weather exposure by other materials).

C. Pressure Preservative Treatment: Treat wood used in the locations described below. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 18 percent for plywood. Provide wood treated according to AWPA U1 with Use Category (UC) suitable for actual service encountered on the Project. Provide product with factory-applied colored dye to readily identify the material on site.
   1. Wood in contact with concrete or masonry.

2.05 FASTENERS

A. Material:
   1. Interior Untreated Wood: Steel.
   2. In accordance with connector manufacturer's recommendations, provide ASTM A153/A153M hot-dip dipped galvanized steel, ASTM F1667 stainless steel, silicon bronze, or copper fasteners for the following:
      a. Interior fire-retardant treated wood.
      b. Preservative treated wood.
   3. Coated or electro-plated fasteners are not acceptable.

B. Provide fasteners as required by applicable codes and as specified in this Section unless other types and spacings are indicated for specific uses.

C. Nails to Connect Wood Nailers and Blocking to Wood:
   1. Length to penetrate wood 1-1/4 inches (32 mm).
   2. Sized for not less than 100 lbs (45.3 kg) withdrawal resistance.
   3. Space in 2 rows staggered at 12 inches (300 mm) on center.

D. Screws to Connect Wood to Metal Deck:
   1. No. 10 sheet metal screws.
   2. Space two rows staggered at 12 inches (300 mm) on center.

E. Fasteners to Connect Wood to Masonry and Concrete:
   1. Expansion anchors or adhesive anchors, type suited to masonry conditions; Hilti or other manufacturer approved by the Architect.
   2. 1 inch (25 mm) diameter, unless otherwise indicated.
   3. Space at 48 inches (1220 mm) on center, maximum.

F. Fasteners to Connect APA Panel Product to Steel Framing: Steel screws, hot-dip galvanized ASTM A153/A153M and as indicated on the Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Arrange work to use full length pieces except where lengths would exceed commercially available lengths. Discard pieces with defects that would lower the required strength or appearance of the work.

B. Cut and fit members accurately. Install plumb and true to line and level.

C. Fasten carpentry in accordance with applicable codes and recognized standards.

D. Where exposed, countersink nails and fill flush with suitable wood filler.

E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.02 MISCELLANEOUS CARPENTRY

A. Provide continuous nailer under cants, around curbs, and around penetrations to fully support curbs and stripped-in metal.

B. Provide nailers on roof deck equal in thickness to roofing insulation.
   1. Drawings do not illustrate actual thickness of insulation at locations to receive tapered insulation, saddles, and crickets.
   2. Do not space blocking or nailers; install continuous lengths with butt joints not exceeding 1/8 inch (3 mm) per 8 feet (2.4 m).

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Install construction panels at locations indicated in Drawings and in accordance with APA E30.

B. Do not paint backer panels for electrical and security equipment.

END OF SECTION

SECTION 06 16 43 - GYPSUM SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum board sheathing.

1.02 REFERENCES

A. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2020.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

E. GA-253 - Application of Gypsum Sheathing; 2018.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each major product required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Keep materials dry at all times.

B. Protect materials against exposure to weather and against contact with damp or wet surfaces.

C. Protect materials from excessive moisture in shipment, storage, and handling.

D. Deliver materials in manufacturer's unopened packages, and store in dry place with adequate air circulation.

E. Stack products of this section carefully to provide air circulation within stacks.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD SHEATHING

A. Fiberglass Faced Gypsum Sheathing; ASTM C1177/C1177M:
   1. Core: Water-resistant silicone-treated gypsum core.
   2. Facers: Alkali-resistant fiberglass mat front and back.
   3. Thickness: 5/8 inch (15 mm).
   4. Surface burning hazard, ASTM E84: 0 flame spread, 0 smoke developed.
   5. Noncombustible when tested in accordance with ASTM E136.
   6. Manufacturer:
      a. GP Gypsum Corporation; Dens-Glass Gold Fireguard Sheathing: www.gp.com/gypsum.
      b. CertainTeed Corporation.; GlasRoc Sheathing Type X: www.certainteed.com.
      c. United States Gypsum Company; Securock Brand Glass-Mat Sheathing Type X: www.usg.com.

2.02 FASTENERS

A. Screws: ASTM C1002; self-drilling type, corrosion-resistant.

B. Gypsum Board Sheathing:
   1. Fasteners for attaching gypsum board sheathing to metal framing:
      a. Up to 18 gauge, 0.0480 inch (1.024 mm) steel framing: Bugle head fine thread, rust resistant, drill point dry wall screws.

b. Over light gauge metal framing or furring: Bugle head fine thread, rust resistant, sharp point dry wall screws.
c. Length for 5/8 inch (16 mm) sheathing: 1-1/4 inch (32 mm) minimum #6.

2. Additional fasteners for attaching gypsum board sheathing to metal framing:
a. 1-1/4 inch (32 mm) wafer head, corrosion-resistant screws with drill or sharp point.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation properly may commence. Do not proceed with the work until unsatisfactory conditions have been resolved fully.

B. Verify that backing strip has been installed at all locations indicated in Section 07 65 00 as required.

3.02 SHEATHING INSTALLATION

A. Comply with manufacturer's instructions and applicable instructions in GA-253, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Install sheathing over framing. Butt joints together. Layout work and use appropriate length material to avoid end joints. Joints shall occur over framing members. Stagger end joints between adjacent panels.

C. Fit sheathing snugly around windows, doors, and other openings.

D. Drive fasteners tight against and flush with sheathing surface. Do not countersink fasteners.

E. Locate fasteners not closer than 3/8 inch (10 mm) from edge and ends of panels.

F. Space fasteners at not more than 8 inches (203 mm) on center at perimeter and field, unless closer spacing is indicated on the drawings or required by UL/Intertek fire-resistant rated assemblies.

G. Moisture Protection: Treat cut edges and holes in sheathing with sealant.

H. Schedule installation of sheathing and of subsequent cladding to avoid exposure of sheathing beyond manufacturer's allowable limits.

I. Replace sheathing that is damaged, fails to meet with reference standard properties for new sheathing at the time permanent cladding is installed, or is otherwise unsuitable.

3.03 FIELD QUALITY CONTROL

A. Inspect completed installation and notify the Architect in writing.

B. Do not conceal sheathing without approval.

3.04 CLEANING

A. During progress of the work, remove from project site all discarded materials, rubbish, and debris resulting from the work.

B. Upon completion, clean all surfaces which have become soiled or coated as a result of work of this section, using proper methods which will not scratch or otherwise damage finished surfaces.

1. For cleaning, use only products and techniques acceptable to manufacturer of products being cleaned.

3.05 PROTECTION

A. Where sheathing barrier is damaged before installation of permanent cladding, repair in accordance with manufacturer's recommendations and to the satisfaction of the Architect.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood slat wall panels.

C. Casings and moldings.

1.02 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

C. AWI (QCP) - Quality Certification Program; Current Edition.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.03 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.

B. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

B. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:

1. Other baseboard and trim: MDF.
2. Wood slat wall panels (WP): Select White Oak.
3. Built-in benches and other items as indicated in Drawings.

2.02 SUSTAINABILITY CHARACTERISTICS

A. Provide composite wood products complying with composite wood indoor emission requirements in Section 01 61 16.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: Select white oak species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Formaldehyde Free Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system with no added formaldehyde; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 130; moisture resistance: MR10.
   2. Panel Thickness: 3/4 inch (19.1 mm).
   3. Finish: Opaque as specified below.

2.05 ACCESSORIES

A. Aluminum Reveal Trim: Extruded reveal shape; smooth surface finish; powder coat paint finish.
   1. Basis of Design: Fry Reglet; Millwork Reveal F MWRF7550.
      a. Color: As selected by Architect from manufacturer's full range.

B. Fasteners: Concealed fasteners as required. Exposed fasteners are not acceptable.

2.06 WOOD TREATMENT

A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

B. Provide identification on fire retardant treated material.

C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 SHOP FINISHING

A. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent (wood):
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: To match Architect's sample.
      c. Sheen: Flat.
   2. Opaque (MDF):
      a. System - 12, Polyurethane, Water-based.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic Laminate Cabinets.

B. Cabinet Hardware.

1.02 REFERENCES

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI A208.1 - American National Standard for Particleboard; 2016.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 SUBMITTALS

A. Product Data.

B. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

C. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

D. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes. Elevations shall be drawn at a scale not less than 1/2" = 1'-0". Details shall be drawn at a scale of not less than 3"= 1'-0".

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI). Manufacturer listings are available at www.awinet.org/find/index.cfm.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Protect units from moisture damage.

1.06 PROJECT CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 ENVIRONMENTAL REQUIREMENTS

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants.
   1. Multipurpose Construction Adhesives: not more than 70 g/l.

B. Indoor Environmental Quality - Low-Emitting Materials - Composite Wood & Agrifiber Products.
   1. Composite Wood and Agrifiber Products: Composite wood and agrifiber products used on the inside of the building (inside of the weatherproofing system) shall contain no added urea formaldehyde resins.
      a. Laminating adhesives used to fabricate on-site and shop applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

2.02 CABINET CONSTRUCTION

A. Perform cabinet construction in accordance with AWI/AWMAC/WI (AWS)Section 400 as follows:

1. Plastic Laminate Cabinets: Custom quality.

2.03 PANEL MATERIALS

A. Formaldehyde:
   1. Panel materials shall comply with California Green Building Materials Table 5.504.4.5 requirements for formaldehyde emission limits measured in accordance with California Air Resources Board, Air Toxics Control Measure for Composite Wood when tested in accordance with ASTM E1333.
      a. Hardwood plywood - veneer core or composite core: 0.05 ppm.
      b. Particleboard: 0.09 ppm.
      c. Medium density fiberboard (MDF): 0.11 pp.
      d. Thin medium density fiberboard - not exceeding 1/16 inch (1.5 mm) or 8 mm: 0.13 ppm.
   2. Panel products shall either be labeled and invoiced as meeting the Composite Wood Products regulation (CCR Title 17 Section 93120 et seq) or shall be accompanied by a chain of custody certification or shall be labeled and comply with PS-1 or PS-2 or Australian AS/NZS 2260 or European 636 3S.

B. Particleboard: ANSI A208.1; medium density industrial type, composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.

C. Formaldehyde Free Medium Density Fiberboard (MDF): ANSI A208.2; composed of wood fibers pressure bonded with moisture resistant adhesive with no added formaldehyde, to suit application; sanded faces; thickness as required.

D. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch (6 mm) thick, smooth two sides (S2S). Use for drawer bottoms, dust panels, and other components indicated on drawings.

2.04 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
   1. Exposed Surfaces: HGS, 0.048 inch (1.2 mm) inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   2. Cabinet Liner: CLS, 0.02 inch (0.5 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
   3. Laminate Backer: BKL, 0.02 inch (0.5 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

B. Manufacturers:
   1. Nevamar: www.nevamar.com.
   2. Panolam Industries: www.panolam.com/pionite.
   3. WilsonArt International: www.wilsonart.com.

C. Surface Color and Pattern:
   1. Basis of Design:
      a. PL1: Wilsonart, 7981K-12 Landmark Wood, SoftGrain finish.
      b. PL2: Wilsonart, D92-60 Dove Grey, Matte finish.
      c. PL3: Pionite, AV971-SD Moonlighting Papel, Textured suede finish.

2.05 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Drawer and Door Pulls: Hafele 3-3/4” bar pull or equal.

C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.

D. Drawer Slides:
   1. Manufacturers:
      a. Basis of Design: Accuride International, Inc.
      b. Hafele America Co.

c. Knape & Vogt Manufacturing Company.

2. Heavy Duty Drawer Slides For Drawers 42 inches (1066 mm) Wide or Less and Standard File Drawers: Accuride 3640.
   a. Type: All ball bearing, full extension, rail/bracket-mounted, hold-in detent, smooth progressive movement with 1 inch (25 mm) overtravel.
   b. Capacity: 200 pounds (90 kg) per pair for 18-inch (457 mm) slide length.
   c. Finish: Clear zinc.

E. Hinges: European style concealed self-closing type, 120 or 125 degree opening angle, steel with polished finish.
   1. Product:
      a. Hafele America Co.; Duomatic Hinges, 200 Series, No. 329.03.558.
      b. Blum # 71T5580.
      c. Salice America Inc.; Series 200, No. C2R9A99.

F. Undercounter Receptacles (UCR)
   1. Basis of Design: Dekko; Ashley Uno - Undermount 305213.01.04.06; Dekko.com.
      a. Cord: 6 feet.
      b. (1) AC 15 Amp Power Outlets, (1) USB-A 2.1 Amp Charging Port & (1) 60-Watt USB-C Power Delivery Charging Port.
   2. Acceptable alternate products:
      a. Mockett; PCS124B/UC/U undermount power dock.
         1) Color: Black.
         2) Corded for plug-n-play.
         3) (1) power outlet; (1) USB-A; (1) USB-C.
      b. Byrne; Dean Under Surface Mounted Power Unit.
         1) Color: Black.
         2) Corded for plug-n-play.
         3) (1) power outlet; (1) USB-A; (1) USB-C.

G. Countertop Support Brackets (CBR)
   1. Load Capacity per bracket: 450 pounds.
   2. Finish: Clear anodized.
   3. Bracket spacing: 36 inches on center maximum.
   4. Bracket attachment: Fasteners/anchors recommended by bracket manufacturer.
   5. Countertop: As specified in Section 12 36 00 Countertops.
   6. Products:
      a. Basis of Design: Centerline Brackets; Island Support System.
      b. Rakks; Inside Wall Mount EH Counter Support Bracket: rakks.com.
      c. Hafele; Countertop Support Bracket, Concealed Design: www.hafele.com.

2.06 FABRICATION - CABINETS

A. Cabinet Style: Flush overlay.

B. Cabinet Doors and Drawer Fronts: Flush style.

C. Drawer Construction Technique: Dovetail joints.

D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (0.6 m) from sink cut-outs.
   1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

H. Locks: Provide on all doors and drawers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION - CABINETS

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.8 mm). Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 42 00 - WOOD PANELING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Custom wood veneer paneling.
   2. Metal laminate wall paneling.
   3. Shop finishing.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.03 SUBMITTALS

A. Product Data: Provide data on fire-retardant treatment materials and application instructions.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Samples: Submit three samples of finished plywood, 6 x 12 inch (150 x 300 mm) in size, illustrating wood grain and specified finish.

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.04 MAINTENANCE MATERIAL

A. Wall Units: Furnish quantity of full-size units equal to 5 percent of amount installed.

B. Carrier Suspension System Components: Furnish quantity of each exposed suspension component equal to 2 percent of amount installed.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org.
   2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index of 0-75, smoke developed index of 0-450, when tested in accordance with ASTM E84.

1.07 MOCK-UP

A. Construct mock-up, 13 feet (4 m) long by 4 feet (1.2 m) wide, illustrating full panel sheet, edge trim, joint trim, applied finish, and fastening.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable codes for fire-retardant requirements.

2.02 PANELING

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Flat Wood Paneling (WP):
   1. Species: Select White Oak.
   2. Cut: Quarter Sliced.
   3. Panels: Veneer of full width and balanced sequence matched.
      a. Panels More Than One Leaf High: Architectural end matching.
      b. Each Panel Within Single Area: Full width premanufactured sets.
   4. Visible Edges and Reveals: Match faces.
   5. Outside Corners: Mitered and splined.

C. Metal Laminate Wall Paneling (MWP):
   1. Panels: Aluminum sheet laminate on MDF.
      a. Basis of Design: MoZ, Blendz Patina Metal Collection; Patina 170 Flat.
      b. Formica, DecoMetal Metal Laminate; M3723-99 Zinc Patina.
      c. Chemetal, 600 Series Architectural Metals; 613 Ember Aluminum.
   2. Visible Edges and Reveals: As indicated on Drawings.
   3. Outside Corners: Mitered.

2.03 WOOD-BASED MATERIALS - GENERAL

A. Formaldehyde Free Medium Density Fiberboard (MDF): ANSI A208.2; composed of wood fibers pressure bonded with moisture resistant adhesive with no added formaldehyde, to suit application; sanded faces; thickness as required.
   1. Use for painted components.

2.04 ADHESIVES AND FASTENERS

A. Adhesives: Type suitable for intended purpose, complying with applicable air quality regulations.

B. Fasteners: Concealed fasteners as required. Exposed fasteners are not acceptable.

2.05 WOOD-TREATMENT PROCESSES

A. Fire-Retardant Treatment (FR-S Type) for Lumber: Chemically treated and pressure impregnated; capable of providing flame spread index of 75, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

2.06 FABRICATION

A. Shop prepare and identify panels for grain matching during site erection.

B. Prepare panels for delivery to site, permitting passage through building openings.

C. Finish exposed edges of panels as specified by grade requirements.

2.07 SHOP FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: To match Architect's sample.
      c. Sheen: Flat.
   2. Opaque (exposed MDF backer):
      a. System - 12, Polyurethane, Water-based.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

2.08 ACCESSORIES

A. Metal Trim:
   1. Material: Extruded aluminum.
   2. Finish: Powder coat; Gun Metal Gray.
   3. Outside Corner Reveal Trim (OCT)
      a. Basis of Design: Fry Reglet; Millwork Reveal Outside Corner, MWROSC75.
   4. L Reveal Trim (LT)
      a. Basis of Design: Fry Reglet; Millwork Reveal L Angle, MWRL75.

B. Wood Filler: Tinted to match surface finish color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

C. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

D. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

E. Touch up damaged finish to match original, using materials provided by fabricator; replace components that cannot be refinished like new.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.8 mm).

END OF SECTION

SECTION 07 11 13 - BITUMINOUS DAMP-PROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous damp-proofing of masonry and cast-in-place concrete to receive masonry veneer.

1.02 REFERENCES

A. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013.

B. ASTM D1668/D1668M - Standard Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing; 1997a (Reapproved 2021).

C. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

A. Product Data.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with NRCA (WM) Waterproofing Manual.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40 deg F (4.44 deg C) for 24 hours before and during application until emulsified damp-proofing has cured.

PART 2 PRODUCTS

2.01 COLD ASPHALTIC MATERIALS

A. Emulsified asphalt, ASTM D1227, Type II, with fiber reinforcement other than asbestos.
   1. Products:
      a. Karnak Chemical Corp: 220 Fibered Emulsion Dampproofing, www.karnakcorp.com.
      b. Master Builders Solutions: MasterSeal 615; www.master-builders-solutions.com/en-us.
      c. W.R. Meadows, Inc: Sealmastic Emulsion No. 721, Type II Brush-On or Spray Grade, www.wrmeadows.com.

B. Sealing Mastic: Asphalt roof cement, ASTM D2822/D2822M, Type I.

C. Asphalt Coated Glass Fabric: ASTM D1668/D1668M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are durable and free of matter detrimental to adhesion or application of damp-proofing system.

C. Verify items that penetrate surfaces to receive damp-proofing are securely installed.

D. Contractor, Designer and manufacturer's technical representative together to examine substrate areas and conditions, with installer present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting the performance of the Work. Manufacturer's representative shall provide written acceptance of substrate prior to damp-proofing application.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive damp-proofing.

B. Clean and prepare surfaces to receive damp-proofing in accordance with manufacturer's instructions.

C. Remove honeycomb, aggregate pockets, fins, ridges, and projecting rough areas. Remove dirt, grease, and mortar droppings.

D. Fill cracks, holes, depressions, and irregularities with detailing mastic as recommended by membrane manufacturer.

E. Form fillets (cants) at inside corners and around projecting elements using detailing mastic.

F. Reinforced Flashing:
   1. Install flashings at outside and inside corners, changes in plane, and penetrations.
   2. Embed 12 inches (305 mm) wide strip of asphalt coated glass fabric in heavy coat of damp-proofing.
   3. Install flashing before applying 2 full coats as specified below.

G. Seal items projecting through damp-proofing surface with mastic. Seal watertight.

H. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

I. Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturer's written instructions.

3.03 APPLICATION

A. Apply bitumen with brush, roller, or spray application as recommended by manufacturer.

B. Apply bitumen in two coats, continuous and uniform, allowing drying time per manufacturer's instructions.

C. Apply at a rate to provide pin-hole-free coating at least 30 mils (0.76 mm) dry film thickness per coat (approximately 60 mils (1.5 mm) wet film at 50% volume solids, depending on surface texture and porosity).

D. Apply touch-up coating over areas where coating is thin or has not formed a smooth lustrous surface. The complete coating shall be free of pinholes and bugholes, skips, holidays, and other defects.

E. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling.

3.04 SCHEDULE

A. Ensure that damp-proofing joins with other masonry flashings, sealants, and waterproofing membranes to form a continuous weather barrier without voids or gaps.

B. Apply to entire surface of masonry exterior back-up wythe, prior to constructing facing material.

C. Apply to concrete turned-down slabs, edge of slabs and exterior columns.

D. Apply to entire bearing surface to receive masonry.

END OF SECTION

SECTION 07 21 00 - BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded Polystyrene Board Insulation on:
   1. Perimeter foundation walls.

B. Rigid (semi-rigid) Fiber Board Insulation.

C. Batt/Blanket Insulation in:
   1. Metal stud walls.

D. Foamed-In-Place Insulation for Cracks and Crevices and Voids.

1.02 REFERENCES

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

E. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging; 2020.

F. ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics; 2021.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

J. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2019.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Shop Drawings:
   1. Illustrate fastener spacing and pattern for securing rigid insulation materials. Coordinate and show fasteners for other materials that penetrate insulation, such as cladding anchors.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damages and from deterioration due to moisture, soiling and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing and protecting during installation.

B. Foam-Plastic Board Insulation: Do not expose to sunlight except to extent necessary for installation and concealment. Protect against ignition at all times. Do not deliver foam- plastic board materials to project site until required for installation.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 FOAM PLASTIC BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C578; Extruded polystyrene board with natural extruded skin surfaces; with the following characteristics:
   1. Board Thickness: As indicated on the drawings.
   2. Board Edges: Square.
   3. Surface Burning Characteristics of the insulation and facings tested separately: Flame spread / smoke developed index not greater than 25/450; ASTM E84.
   4. Vertical application:
      a. Between 0 and 8 feet (0 and 2.43 m) below grade: At least 25 psi (0.17 MPa)25 psi compressive strength (Type IV).
      b. Between 8 and 12 feet (2.43 and 3.65 m) below grade: At least 40 psi (0.27 MPa) compressive strength (Type VI).
      c. Between 12 and 16 feet (3.65 and 4.87 m) below grade: At least 60 psi (0.41 MPa) compressive strength (Type VII).
   5. Adhesive: Type recommended by insulation manufacturer for application.

2.02 FIBER BOARD INSULATION MATERIALS

A. Mineral Fiber Board Insulation- Exterior Cladding Use: Rigid mineral fiber made from rock or slag, ASTM C612.
   1. Unfaced.
   2. Combustibility, ASTM E136: Non-combustible.
   3. Flame spread index, ASTM E84: Zero.
   4. Smoke Developed Index, ASTM E84: Zero.
   5. Corrosiveness to steel, ASTM C665: Non-corrosive.
   6. Corrosiveness to stainless steel, ASTM C795: Pass.
   7. Water vapor transmission, ASTM E96/E96M: 27 perms (1545 ng/s/sq.m/Pa) or greater.
   8. Moisture sorption, ASTM C 1104: 0.03% - 0.07%.
   9. Board Thickness: As shown on the drawings.
   10. Manufactured for specific use as insulation in moist or wet cladding cavity applications.
   11. Products for Cladding Applications:
      a. "CavityRock"; Rockwool A/S: www.rockwool.com.
         1) Density (dual density board), ASTM C612: 6.2 pcf (100 kg/cu.m.) outer layer, 3.8 pcf (61 kg/cu.m.) inner layer.
      b. "RainBarrier HD"; Thermafiber: www.thermafiber.com.
         1) Density, ASTM C612: 6 pcf (96 kg/cu.m.).

B. Fiber Board Insulation Fasteners:
   1. Corrosion-resistant (corrosion resistance equal to or greater than Galvalume) screw fastener plus 3 inch (75 mm)-diameter Galvalume or plastic plate-type washer:
      a. OMG Roofing Products.
      b. SFS Intec.
      c. Trufast.

2.03 BATT/BLANKET INSULATION MATERIALS

A. Batt/Blanket Insulation: ASTM C665; friction fit, conforming to the following:
   1. Material: Preformed mineral wool batt/blanket made from rock or slag.
   2. Unfaced.
   3. Surface Burning Characteristics of insulation when tested without facing: Flame spread/Smoke developed index not more than 25/450, when tested in accordance with ASTM E 84.
   4. Width of Batt/Blankets: Sized for tight friction fit between faces of studs without sagging or slumping.

5. Depth of Batt/Blankets: Fill the full depth of framing cavity with insulation, leaving no air gap from interior face of gypsum wallboard to interior face of sheathing, unless a specific depth of insulation is dimensioned on the Drawings.
6. Depth of Mineral Wool Batts installed in Stud Walls / minimum rated R-value:
   a. 2x6 inch (50x150 mm) steel studs: R-23, 6 inch (150 mm).
   b. 2x8 inch (50x200 mm) steel studs: R-23, 6 inch (150 mm) batt plus an R-7, 2 inch (50 mm) batt.
7. Manufacturers:
   a. Thermafiber: www.thermafiber.com.
   b. Owens Corning Corp.: www.owenscorning.com.
   c. Intelligent Insulation Group (Calsilite/Johns-Manville): www.intelligentinsulation.com.
   d. Rockwool A/S Inc.: www.rockwool.com.

2.04 ACCESSORIES

A. Sprayed-In-Place Foam: Slightly expansive, polyurethane insulating foam sealant that generates an air-tight, water-resistant seal and tenacious bond to adjacent surfaces.
   1. Nominal Density: 2 pcf (32 kg/cu.m.).
   2. Dimensional Stability: Less than 1.5% volume change per ASTM D2126 at 1 week.
   3. Open Cell Content: less than 8% per ASTM D6226.
   4. Flame spread / Smoke developed, ASTM E84: Not greater than 10 / 20.
   5. Concealed by 15-minute thermal barrier: DuPont de Nemours, Inc.Great Stuff Pro or DuPont de Nemours, Inc.Froth Pak (Type V Construction only) or DuPont de Nemours, Inc.Froth Pak Ultra (Type I-V Construction).
   6. For interior use: NFPA 286 approved for exposed use to the interior without need for a 15-minute thermal barrier. Allowable exposure: Not exceeding 6 inches (150 mm) wide by 2 inches (50 mm) deep x unlimited length. DuPont de Nemours, Inc.Froth Pak.
   7. Approved for use by ICC Evaluation Service for applications of the type in this Project.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation .

B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.02 POLYSTYRENE BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:
   1. Apply a continuous bead 1 to 2 inches (25 to 50 mm) from the perimeter of each board plus an "X" running from corner to corner.

B. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 FIBER BOARD INSULATION

A. Fit insulation snugly against adjacent construction and with tight butt joints between boards.

B. Trim insulation to neatly fit. Insulate miscellaneous gaps and voids.

C. Coordinate fastening and anchorage of insulation with fastening and anchorage of cladding. Ensure that insulation is well secured in permanent fashion and in compliance with the insulation manufacturer's written fastener spacing and pattern recommendations.

3.04 BATT/BLANKET INSTALLATION

A. Install insulation in accordance with manufacturer's instructions, without gaps or voids.

B. Install in exterior wall spaces.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 MISCELLANEOUS VOIDS

A. Fill cracks and crevices with sprayed-in-place foam where indicated. Seal against the passage of air, moisture, dust, and noise. Observe the maximum and minimum thickness limitations indicated on the product packaging and manufacturer's instructions.

3.06 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 25 10 - WEATHER-RESISTANT BARRIER (LIQUID-APPLIED)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Weather-resistant barrier applied to the entire outside surface of exterior walls, including:
   1. Sheathing.
   2. CMU.
   3. Cast-in-place concrete.

B. Water-Resistive Barrier: Materials to keep liquid water from passing through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints around penetrations through exterior walls.

C. Air Barrier: Materials to keep air from passing through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints around penetrations through exterior walls.

1.02 SYSTEM DESCRIPTION

A. Install materials to form a secondary weather barrier to direct water penetrating the exterior cladding down and out to the exterior.

B. Extend materials across joints and seams in similar and dissimilar substrates and around doors, windows, and other openings to form a continuous barrier against intrusion of water and air.

1.03 REFERENCES

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. Product Data: Indicate material characteristics, performance criteria, and limitations.

B. Manufacturer's Installation Instructions: Indicate preparation, installation methods, storage requirements, and temperature limitations during and after installation.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Reports: Submit reports signed by Contractor, installer, and membrane manufacturer's representative of:
   1. Preapplication review.
   2. Completion inspections.

1.05 QUALITY ASSURANCE

A. Preapplication Review: Schedule a meeting before start of installation with installer and membrane manufacturer's representative to review procedures for substrate preparation and application.
   1. Review contract document requirements, manufacturer's product data, and application instructions.
   2. Manufacturer’s representative shall instruct installers in proper installation procedures, and shall be available throughout project for trouble shooting upon request.

B. Quality Control Logs: Maintain daily logs recording weather conditions; conditions of substrates; work installed; number, location and thickness found at all mil gauge checks specified in Part 3; and deficiencies found and corrected.
   1. Provide copies of reports to Architect on a weekly basis when work is in progress.

1.06 MOCK-UP

A. Construct mock-up as specified in Section 01 43 40 - Exterior Wall Mock-Up.

B. Construct mock-up demonstrating each typical condition, including perimeters, transitions to other envelope materials such as waterproofing and roofing, penetrations, each type of substrate, and openings such as windows, doors, and louvers.

C. Obtain the approval of the manufacturer's designated representative before beginning full production.

D. Obtain the Architect's approval before beginning full production.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

B. Do not apply coatings when there is a chance that frost may occur before coating is fully cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Contractor shall select a single manufacturer to provide products of this Section and of Section 07 65 00 - Flexible Flashing.

B. Provide products of one of the following:
   1. Carlisle.
   2. Henry Company.
   3. GCP Applied Technologies, Inc.

2.02 WEATHER-RESISTANT BARRIER

A. Vapor Permeable, Air and Liquid Water Barrier: Full Membrane on the Entire Outside Surface of Exterior Wall Substrates; Rolled or sprayed coating forming an elastomeric barrier that is water vapor permeable:
   1. Compliant with NFPA 285 tested assemblies as required by the ICC (IBC).
   2. Product:
      a. Carlisle: Fire Resist Barritech VP. Application thickness: 60 mils (1.5 mm) wet, 40 mils (1.0 mm) dry.
      b. Henry: Air-Bloc 17MR. Application thickness: 5.4 gal/100 sq.ft. (2.2 l/sq.m) (90 mils (2.3 mm) wet, 45 mils (1.1 mm) dry) over CMU; 70 mils (1.7 mm) wet, 35 mils (0.8 mm) dry over other substrates.
      c. GCP Applied Technologies, Inc.: Perm-A-Barrier VPL. Application thickness 68 mils (1.72 mm) wet, 40 mils (1.0 mm) dry.
      d. GCP Applied Technologies, Inc.: Perm-A-Barrier VPL LT. Application thickness: 68 mils (1.72 mm) wet, 35 mils (0.8 mm) dry.

B. Application Thicknesses: Thicknesses specified above are nominal. Coverage will vary according to the profile, porosity, and absorption of the substrate and project conditions. Apply liquid membrane to comply with all of the following:
   1. Apply liquid membrane at coverage rate so that the completed and cured membrane will be pin-hole free.
   2. Apply liquid membrane in one or more coats as recommended by the manufacturer and at wet mil thickness per coat as recommended by manufacturer.
   3. Apply liquid membrane at coverage rate and number of coats so that the average dry thickness of the completed and cured membrane will be not less than that specified and so that its minimum thickness at any point shall be not less than that 90 percent of that specified.
   4. Specified thicknesses are in addition to the thickness of detail coat and transition sheet.

2.03 ACCESSORY MATERIALS

A. Transition Sheet:
   1. Modified asphalt, bonded to sheet polyethylene, self-adhesive.
   2. Thickness: At least 40 mils (1.0 mm).

3. Compliant with NFPA 285 tested assemblies as required by the ICC (IBC).
4. Products:
   a. Carlisle: CCW 705FR Self-Adhering Air and Vapor Barrier.
   b. Henry: Blueskin SA.
   c. GCP Applied Technologies, Inc.: Perm-A-Barrier Wall Flashing or Perm-A-Barrier Detail Membrane or Perm-A-Barrier Aluminum Flashing.

B. Provide primer/adhesive recommended by transition membrane manufacturer for each specific substrate. Use of primer/adhesive is a contract requirement.

C. Mastic: Trowel or caulking grade rubberized mastic or sealant.
1. Products:
   a. Carlisle: LM-800XL.
   b. Henry: Air-Boc 06 Trowel Grade.
   c. GCP Applied Technologies, Inc.: Bituthene Liquid Membrane.
   d. GCP Applied Technologies, Inc.: Grace S100 Sealant.
2. Provide mastic recommend by membrane manufacturer for sealing edges and laps of transition membrane.

D. Accessories:
1. Mesh Tape: Fiber glass mesh; 4 to 6 inches (100 to 150 mm) wide; type as recommended by membrane manufacturer.
2. Tape for Plastic Substrates with GCP Applied Technologies, Inc.: Pre-Pruf Tape at plastic substrates indicated in PART 3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 SURFACE PREPARATION

A. Remove loose or foreign matter which might impair adhesion of materials.

B. Clean and prime substrate surfaces to receive transition sheet in accordance with manufacturer's instructions.

C. Ensure that substrates are clean, dry, and dust-free.

D. Prime dusty or porous surfaces with manufacturer's recommended primer.

E. Ensure that joints in CMU are filled with mortar (no voids) and struck flush (neatly tooled is acceptable for membrane spray application), ready to receive membrane.

3.03 SUBSTRATE PREPARATION AND DETAILING

A. Treat joints in sheathing substrates by applying detail coating of membrane (or recommended sealant) as specified below prior to general membrane application. Untreated butt joints of any width are not acceptable (even if allowed by manufacturer's minimum recommendations).
1. Fill minor gaps with mastic or sealant and allow to cure before applying mesh tape and membrane liquid. (Treat gaps over manufacturer's permitted width with transition membrane.)
2. Apply mesh tape to butt joints in sheathing.
3. Apply detail coating of membrane (or recommended sealant) to joints and extending 2 inches (50 mm) onto substrate beyond joint tape.
4. Treat inside corners joints by applying a 1 inch (25 mm) fillet of mastic, allowing it to cure, then following with a detail coating of membrane extending 6 from each side of the corner. (Where manufacturer recommends transition sheet at inside corners, install transition sheet.)
5. Install transition sheet at outside corners. Extend sheet as recommended by membrane manufacturer, but in no case less than 3 inches (75 mm) each side of the corner and on to face of wall (6 inches (150 mm) total).

B. Treat minor static cracks in concrete and masonry substrates by applying a reinforced detail coating of membrane prior to general membrane application.
   1. Fill minor gaps with mastic or caulk and allow to cure before applying mesh tape and membrane liquid. (Treat gaps over manufacturer's permitted width with transition membrane.)
   2. Apply mesh tape extending at least 2 inches (50 mm) on each side of crack or joint.
   3. Apply detail coating of membrane to mesh tape and extending 2 inches (50 mm) onto substrate beyond joint tape.

C. Treat joints between masonry and dissimilar substrates in accordance with manufacturer's recommendation prior to general membrane application.

D. Ensure that mortar joints in masonry substrates are struck flush and filled full without voids, and that no holes or other voids exist in masonry surface. Repair such defects by pointing with mortar as specified in Division 04 or filling with membrane manufacturer's recommended mastic.
   1. Where masonry rests on concrete floor slab or foundation, rake back mortar joint 1/4 inch (6 mm) and fill with mastic, allow to cure, and follow with a detail coating of membrane extending at least 3 inches (75 mm) on either side of joint.
   2. Where top of non-bearing masonry abuts the underside of floor slab, install transition sheet as described in the paragraph below.
   3. Where top of load-bearing masonry abuts the underside of a concrete floor slab or concrete edge beam, rake back mortar joint 1/4 inch (6 mm) and fill with mastic, allow to cure, and follow with a detail coating of membrane extending at least 3 inches (75 mm) on either side of joint.
   4. Where masonry abuts concrete columns, rake back mortar joint 1/4 inch (6 mm) and fill with mastic, allow to cure, and follow with a detail coating of membrane extending at least 3 inches (75 mm) on either side of joint.
   5. Where masonry abuts steel columns, beams, or other steel elements, install transition sheet as described in the paragraph below.

E. Apply transition sheet at juncture of membrane and other materials and at interruptions such as beams, columns, or other dissimilar substrates . Width of transition sheet as recommended by membrane manufacturer, but in no case less than 3 inches (75 mm) on each side of joint (6 inches (150 mm) total).

F. Install transition sheet at control and expansion joints. Apply transition sheet across joints as recommended by membrane manufacturer, but in no case less than 3 inches (75 mm) each side joint on to face of wall (6 inches (150 mm) total).

G. Transition Sheet:
   1. Prime substrates before installing transition sheet using a detail coating of membrane or primer, as recommended by manufacturer.
   2. Apply sheet material to primed surface, and firmly roll the entire surface of sheet material with a roller not more than 4 inches (100 mm) wide (use fingers or a blunt tool at confined corners and crevices) to ensure firm, permanent bond without voids or fishmouths or blisters.
   3. Seal laps and perimeters of sheet with mastic.

H. Penetrations Through Membrane, Such as Pipes, Conduit, Electrical Boxes, Etc.: Seal around penetrations through the membrane. Ensure that penetrations are securely fixed and anchored before sealing.
   1. Install a fillet of mastic around penetration to provide a smooth transition between the penetrating object and the adjacent substrate. Allow to cure. Apply membrane at least 2 inches (50 mm) onto the adjacent substrate and at least 2 inches (50 mm) onto the penetration.
      a. GCP: For plastic pipes and similar substrates, install tie-in tape before sealing.

3.04 DETAILING AROUND OPENINGS

A. Install detailing membrane around openings such as window, door, louver, and other openings. Ensure that opening detailing is complete before to applying wall membrane.

B. Detailing Membrane at window, door, louver, and other openings - Sheet Material:
   1. Wrap transition sheet into opening a sufficient distance to ensure contact with the inboard air seal (joint sealant) between the sheet and the frame of the window, door, louver, etc., and to form a back dam against water intrusion.
   2. Wrap transition sheet onto the outside face of the wall as recommended by membrane manufacturer, but in no case less than 3 inches (75 mm) on to face of wall.

3.05 WALL MEMBRANE INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Install membrane in conjunction with materials described in other sections to provide a continuous, sealed barrier on the exterior enclosure of the building.

C. Apply liquid membrane using manufacturer's recommended equipment. Ensure that adequate film thickness is applied, and that film is continuous without pinholes, holidays, or thin spots or excessively thick spots.
   1. On masonry substrates ensure that adequate material is applied to a) fill the pores of the block pinhole free, and b) provide nominal film thickness over the high spots (aggregate).
   2. On concrete substrates ensure that adequate material is applied to bridge or fill bug holes or other irregularities pinhole free.
   3. Lap liquid membrane onto transition sheet and previously prepared liquid or mastic detailing.

D. Apply within recommended application temperature ranges.

E. Use mil gauge to verify thickness. Provide one check for every 100 square feet and document in daily log.

F. Form a continuous seal between the exterior wall membrane and roofing material.

3.06 SELF-ADHESIVE SHEET AT CLADDING ANCHORS AND OTHER PENETRATIONS

A. Where exterior cladding anchors (masonry veneer, metal cladding, and other penetrating materials) are mechanically fastened through the weather membrane, provide transition sheet material underneath of anchors. Size sheet material to extend approximately 1/2 inch (13 mm) beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to create an air-tight and weather-tight seal.

B. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic to form an air-tight and weather-tight seal.

C. Other Openings and Penetrations: Seal and provide flashings for other openings so as to provide an air-tight, weather-tight barrier.

3.07 FIELD QUALITY CONTROL

A. Just prior to covering, inspect weather-resistant barrier to ensure that it forms a continuous, uninterrupted barrier over the entire wall surface in full compliance with this specification and the manufacturer's installation instructions. Ensure that the barrier is undamaged by exposure, weather, or other inadvertent damage.

B. Obtain wall membrane manufacturer representative's inspection of the completed installation prior to covering.

C. Notify the Architect when Contractor's inspection is complete.

D. Do not cover installed weather-resistant membrane until required inspections have been completed.

3.08 PROTECTION

A. During construction and until permanent protection is in place, provide temporary protective weather-proof sheeting or other covering to prevent moisture intrusion into tops of walls and through back side of walls.

B. Do not allow materials to be exposed to sunlight or weather for periods longer than recommended by manufacturer.

C. Protect installed materials from damage by subsequent trades. Repair inadvertent damage before covering with other materials.

END OF SECTION

SECTION 07 42 13 - METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for walls, with related flashings and accessory components.

1.02 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

1.03 SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.
   1. Submit shop drawings bearing the seal of a structural engineer experienced in design of this type of Work and licensed in the State in which the Project is located.

C. Samples: Submit three samples of wall panel and soffit panel, 12 inch by 12 inch (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.

D. Delegated Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.

1.04 WARRANTY

A. Correct defective work within a five year period after Date of Final Acceptance for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:
   1. Basis of Design:
      a. ATAS International, Inc; Metafor: www.atas.com.

B. Other Acceptable Manufacturers:
   1. Morin; www.morincorp.com.
   2. Petersen Aluminum Corporation: www.pac-clad.com.

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels and subgirt framing assembly.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall, as indicated on the Structural Drawings for components and cladding.
   3. Design Pressure: In accordance with ASCE 7.
   4. Maximum Allowable Deflection of Panel: L/180 for length (L) of span.
   5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when

subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
8. Corners: Factory-fabricated in one continuous piece with minimum 2 inch (51 mm) returns.

B. Exterior Panels:
1. Profile: Vertical.
2. Side Seams: Double-interlocked with reveal, sealed with continuous bead of sealant.
3. Material: Precoated aluminum sheet, 18 gauge, 0.0403 inch (1.02 mm) minimum thickness.
4. Panel Width: 12 inches (305 mm).
5. Color: As selected by Architect from manufacturer's custom line.

C. Subgirts:
1. 8 gauge, 0.125 inch (3.18 mm) thick formed non-precoated aluminum sheet.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Stainless steel.

2.03 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Non-Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface, mill finish.

2.04 FINISHES

A. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness (DFT) of 0.9 mil (0.023 mm); color and gloss as selected by Architect from manufacturer's custom range.

2.05 ACCESSORIES

A. Sealants:
1. Silicone, type as specified in Section 07 92 00.

B. Thermal Break Anchors, Clips, and Accessories: Use the following where insulation is present:
1. Basis of Design: Cascadia Windows Inc., Cascadia Clip, www.cascadiaclip.com.
2. Sub-framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
a. Thermal Spacer thickness for top, base and web: 3/16 inch (5 mm) nominal.
b. Thermal spacer depth: as required by thickness of thermal insulation.
1) Depth tolerance: +/- 0.005 inch (0.13 mm).
3. Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.
a. Fastener for steel framing: 1/4 - #14 x required length with hex head.
1) Acceptable material: Leland Industries Inc., Master Driller™ No. 2 Mini Drill Point with DT2000 coating.

C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, stainless steel. Fastener cap same color as exterior panel.
1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Fasten panels to structural supports; aligned, level, and plumb.

C. Locate joints over supports.

D. Lap panel ends minimum 2 inches (51 mm).

E. Use concealed fasteners unless otherwise approved by Architect.

3.02 THERMAL BREAK ANCHORS, CLIPS, AND ACCESSORIES:

A. Pre-drill concrete or concrete masonry unit substrate to 1/2 inch (13 mm) deeper than anticipated embedment depth of fastener into substrate.
   1. Use drill diameter approximately 1/16 inch (1.5 mm) less than screw diameter in accordance with fastener manufacturer’s written recommendations.

B. Where cladding is attached to sheathing and stud substrates, install self-adhesive sheet membrane at each location to receive a thermal break anchor. Press entire surface area of sheet firmly against substrate using 4 inches (100 mm) to 6 inches (150 mm) wide steel hand roller. Continue pressing and rolling until entire sheet is well bonded to substrate. Place anchor on top of sheet membrane and fasten through to stud. Size sheet material to extend approximately 1/2 inch (13 mm) beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to form an air-tight and weather-tight seal. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic (product acceptable to the air barrier manufacturer) to form an air-tight and weather-tight seal.

C. Sub-framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

D. Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer’s written recommendations.
   1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate spacing as required to support gravity and wind loading of cladding but not more than 26 inches (660 mm) maximum on center vertically and 16 inches (406 mm) maximum on center horizontally.

E. Installation sequence for spacers, sub-framing, and insulation - Option 1:
   1. Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install thermal spacers and screws for first Z-girt / track. For subsequent girts:
      a. Fasten top spacer with single screw through Z-girt and spacer into substrate ensuring spacer can pivot for accurate alignment.
      b. Friction fit insulation in place before completing installation of remaining screws to secure Z-girt and thermal spacers.
      c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
      d. Ensure insulation pieces are in contact with no linear gaps between spacers.

F. Installation sequence for spacers, sub-framing, and insulation - Option 2:
   1. Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install spacers, screws and sub-framing, prior to installing insulation.
   4. Friction fit insulation in place as follows:
      a. For semi-rigid insulation batts or boards, score or cut insulation down its centerline to 50% maximum of its depth to enable fitting insulation in correct position.

b. Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.
c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.

5. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches (406 mm) maximum on center along centerline of insulation batts or boards and in accordance with insulation manufacturer's written recommendations.
   a. Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
   b. Use 3 minimum stick pins or retention devices for each 4 feet (1.2 m) long batt or board.
6. Ensure insulation pieces are in contact with no linear gaps between spacers.

3.03 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch (6.4 mm).

3.04 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 07 42 14 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.

B. Matching flashing and trim.

1.02 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2022.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

I. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

J. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

K. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2020.

L. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2021.

M. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet; 2010 (Reapproved 2018).

N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

P. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

Q. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2019.

1.03 SUBMITTALS

A. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the wall system must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches (1:10).
   6. Submit shop drawings bearing the seal of a structural engineer experienced in design of this type of Work and licensed in the State in which the Project is located.

D. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch (305 mm) square, and representing actual product in color and texture.

E. Delegated Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.

F. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.

G. Test Report: Submit report of full-size mock-up test for NFPA 285 fire performance.

H. Testing Agency's Qualification Statement.

I. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

B. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
   1. Locate as part of exterior wall mock-up indicated in Section 01 43 40.
   2. Provide panels finished as specified.

1.05 WARRANTY

A. MCM Sheet Manufacturer’s Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 5 years:
   1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
   2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material (MCM) Sheet Manufacturers:
   1. 3A Composites USA; Alucobond Plus: www.alucobondusa.com/#sle.
   2. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): www.alpolic-americas.com/#sle.
   3. Alucoil North America LLC; larson by Alucoil, FR Core (fire resistant): www.alucoilnorthamerica.com/#sle.
   4. Arconic; Reynobond FR; www.arconic.com.
   5. Fairview Architectural LLC; VitraBond (Fire Rated): www.fairview-na.com/#sle.

2.02 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
   1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
   2. Provide panel jointing and weatherseal using reveal joints and gaskets but no sealant.
   3. Anchor panels to supporting framing without exposed fasteners.

B. Performance Requirements:
   1. Provide tests on full-size mock-ups; tests performed previously for other projects are acceptable provided tested assemblies are truly equivalent to those to be used on this project, unless otherwise indicated.
   2. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F (minus 29 degrees C) to 180 degrees F (82 degrees C) without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
   3. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
      a. Wind load as indicated on the Structural Drawings for components and cladding.
      b. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
      c. Maximum anchor deflection in any direction of 1/16 inch (1.6 mm) at connection points of framing members to anchors.
   4. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing performed for previous project is acceptable provided tested system was truly equivalent.

C. Panels: One inch (25 mm) deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
   1. Reinforce corners with riveted aluminum angles.
   2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
   3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
   4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
   5. Metallic Finished Panels: Maintain consistent grain of MCM sheet; specifically, do not rotate sheet purely to avoid waste.
   6. Fabricate panels under controlled shop conditions.
   7. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
   8. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
      a. Make panel lines, breaks, curves and angles sharp and true.
      b. Keep plane surfaces free from warp or buckle.
      c. Keep panel surfaces free of scratches or marks caused during fabrication.
   9. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
   10. For "dry" jointing, secure extrusions to returned pan edges with stainless steel rivets; provide means of concealed drainage with baffles and weeps for water that might accumulate in members of system.

D. Column covers: as indicated in Drawings.

2.03 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
   1. Provide panels with FR core for use in assemblies tested in accordance with NFPA 285. PE core not acceptable.
   2. Overall Sheet Thickness: 4 mm, minimum.
   3. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch (100 N-mm/mm) with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F (21 degrees C).
   4. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   5. Flammability: Self-ignition temperature of 650 degrees F (343 degrees C) or greater, when tested in accordance with ASTM D1929.
   6. Factory Finish: Three coat fluoropolymer resin coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.
      a. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.
      b. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
   7. Color/Texture: As selected by Architect from manufacturer's custom range.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

C. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
   1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
   2. Stainless Steel Sheet Components: ASTM A480/A480M.
   3. Aluminum Components: ASTM B209 (ASTM B209M); or ASTM B221 (ASTM B221M).

D. Flashing: Sheet aluminum; 0.040 inch (1.0 mm) thick, minimum; finish and color to match MCM sheet; refer to Section 07 62 00 for additional requirements.

E. Thermal Break Supports, Anchors, Clips, and Accessories: Use the following where insulation is present:
   1. Basis of Design: Cascadia Windows Inc., Cascadia Clip, www.cascadiaclip.com.
   2. Sub-framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
      a. Thermal Spacer thickness for top, base and web: 3/16 inch (5 mm) nominal.
      b. Thermal spacer depth: as required by thickness of thermal insulation.
         1) Depth tolerance: +/- 0.005 inch (0.13 mm).
   3. Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel..
      a. Fastener for steel framing: 1/4 - #14 x required length with hex head.
         1) Acceptable material: Leland Industries Inc., Master Driller™ No. 2 Mini Drill Point with DT2000 coating.

F. Anchors, Clips and Accessories: Use one of the following where insulation is not present:
   1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
   2. Aluminum Components: ASTM B209 (ASTM B209M); or ASTM B221 (ASTM B221M).

G. Fasteners:
   1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
   2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.

3. Bolts: Stainless steel.
4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

H. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.
1. Refer to Section 07 92 00 for additional requirements.

I. Provide panel system manufacturer's and installer’s stainless steel accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.
1. Verify that weather barrier system is properly installed, refer to Section 07 25 00 for requirements.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.

C. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect in writing; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Where joints are indicated in Drawings for field applied sealant, seal joints completely with specified sealant.

H. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
1. Variation From Plane or Location: 1/2 inch in 30 feet (10 mm in 10 m) of length and up to 3/4 inch in 300 feet (20 mm in 100 m), maximum.
2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet (3 mm in 9 m) run, maximum.
3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet (3 mm in 9 m) run, maximum.
4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch (0.75 mm), maximum.

J. Replace damaged products.

3.03 THERMAL BREAK ANCHORS, CLIPS, AND ACCESSORIES:

A. Pre-drill concrete or concrete masonry unit substrate to 1/2 inch (13 mm) deeper than anticipated embedment depth of fastener into substrate.
   1. Use drill diameter approximately 1/16 inch (1.5 mm) less than screw diameter in accordance with fastener manufacturer's written recommendations.

B. Where cladding is attached to sheathing and stud substrates, install self-adhesive sheet membrane at each location to receive a thermal break anchor. Press entire surface area of sheet firmly against substrate using 4 inches (100 mm) to 6 inches (150 mm) wide steel hand roller. Continue pressing and rolling until entire sheet is well bonded to substrate. Place anchor on top of sheet membrane and fasten through to stud. Size sheet material to extend approximately 1/2 inch (13 mm) beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to form an air-tight and weather-tight seal. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic (product acceptable to the air barrier manufacturer) to form an air-tight and weather-tight seal.

C. Sub-framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

D. Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer's written recommendations.
   1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate spacing as required to support gravity and wind loading of cladding but not more than 26 inches (660 mm) maximum on center vertically and 16 inches (406 mm) maximum on center horizontally.

E. Installation sequence for spacers, sub-framing, and insulation - Option 1:
   1. Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install thermal spacers and screws for first Z-girt / track. For subsequent girts:
      a. Fasten top spacer with single screw through Z-girt and spacer into substrate ensuring spacer can pivot for accurate alignment.
      b. Friction fit insulation in place before completing installation of remaining screws to secure Z-girt and thermal spacers.
      c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
      d. Ensure insulation pieces are in contact with no linear gaps between spacers.

F. Installation sequence for spacers, sub-framing, and insulation - Option 2:
   1. Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install spacers, screws and sub-framing, prior to installing insulation.
   4. Friction fit insulation in place as follows:
      a. For semi-rigid insulation batts or boards, score or cut insulation down its centerline to 50 % maximum of its depth to enable fitting insulation in correct position.
      b. Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.
      c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
   5. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches (406 mm) maximum on center along centreline of insulation batts or boards and in accordance with insulation manufacturer's written recommendations.
      a. Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
      b. Use 3 minimum stick pins or retention devices for each 4 feet (1220 mm) long batt or board.

6. Ensure insulation pieces are in contact with no linear gaps between spacers.

3.04 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 46 10 - LINEAR SOFFIT AND WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Linear metal ceilings.

B. Linear soffits and wall panels.

C. Suspended metal support system and perimeter trim.

1.02 REFERENCE STANDARDS

A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

B. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

1.03 SUBMITTALS

A. Product Data: Furnish for component profiles.

B. Shop Drawings: Indicate reflected ceiling plan and wall panel elevations.

C. Samples: Submit three samples 12 by 12 inch (305 by 305 mm) in size illustrating color and finish of components exposed to view.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Linear Panels: Five of each type, standard length.

1.04 WARRANTY

A. Manufacturer Warranty: Provide 5-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Linear Ceilings, Soffits and Wall Panels:
   1. Basis of Design: Facil Facades; Surface S-100, Turner Oak Malt.
   2. Other acceptable products:
      a. Longboard; Longboard Cladding 4" V-Groove Tongue & Groove Planks, Beechwood (BEE).
      b. Rulon; Endure Linear Native Oak (230).

2.02 LINEAR CEILINGS, SOFFITS AND WALL PANELS

A. Linear Ceiling, Soffit, and Wall Panel System: Panels, suspension members, trim, and accessories as required to provide a complete system.

B. Performance Requirements:
   1. Design to support imposed loads of indicated items without eccentric loading of supports.
   2. Design for maximum deflection of 1/360 of span.
   3. Systems Located Outside Building Envelope:
      a. Accommodate wind and suction loads and wind uplift without damage in accordance with applicable code.

2.03 COMPONENTS

A. Linear Panels:
   1. Type: Linear panel with reveals; snap-in installation.
      a. Size and Configuration: As indicated on drawings.
      b. Panel Profile: Channel shaped with square edges.
      c. Spacing: 3/4 inch (19 mm) reveal between panels.

B. Edge Molding, Expansion Joints, and Splices: Same material, thickness, and finish as linear panels.

C. End Caps: Formed metal; same color and finish as sight-exposed surfaces of linear panels.

D. Accessories: Stabilizer bars as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.

E. Suspension Members: Formed aluminum sections, with integral attachment points; size and type to suit application and soffit and ceiling system flatness requirement specified.

F. Suspension Wire: Size and type as required for application and soffit and ceiling system flatness requirement specified.

G. Thermal Break Anchors, Clips, and Accessories: Use the following where insulation is present:
   1. Basis of Design: Cascadia Windows Inc., Cascadia Clip, www.cascadiaclip.com.
   2. Sub-framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
      a. Thermal Spacer thickness for top, base and web: 3/16 inch (5 mm) nominal.
      b. Thermal spacer depth: as required by thickness of thermal insulation.
         1) Depth tolerance: +/- 0.005 inch (0.13 mm).
   3. Spacer Fasteners: High hex head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.
      a. Fastener for steel framing: 1/4 - #14 x required length with hex head.
         1) Acceptable material: Leland Industries Inc., Master Driller™ No. 2 Mini Drill Point with DT2000 coating.

H. Subgirt Members: 8 gauge, 0.125 inch (3.18 mm) thick formed non-precoated aluminum sheet.

I. Insulation: See Section 07 21 00.

J. Touch-up Paint For Concealed Items: Zinc rich type.

2.04 FABRICATION

A. Shop cut linear panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that layout of hangers will not interfere with other work.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Suspension Components:
   1. Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
   2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
   3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.

B. Wall Panel Support System: As indicated in Drawings.

C. Linear Soffit and Wall Panels:
   1. Install linear panels, baffles, and other system components in accordance with manufacturer's instructions.
   2. Set exterior end joints with 1/8 inch (3 mm) gap for expansion and contraction.

3. Provide expansion joints to accommodate plus or minus 1 inch (25 mm) movement and maintain visual closure.
4. Install prefabricated corner sections at changes in panel direction.
5. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
6. Install end caps at sight-exposed ends of linear panels.
7. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

3.03 THERMAL BREAK ANCHORS, CLIPS, AND ACCESSORIES:

A. Pre-drill concrete or concrete masonry unit substrate to 1/2 inch (13 mm) deeper than anticipated embedment depth of fastener into substrate.
   1. Use drill diameter approximately 1/16 inch (1.5 mm) less than screw diameter in accordance with fastener manufacturer's written recommendations.

B. Where cladding is attached to sheathing and stud substrates, install self-adhesive sheet membrane at each location to receive a thermal break anchor. Press entire surface area of sheet firmly against substrate using 4 inches (100 mm) to 6 inches (150 mm) wide steel hand roller. Continue pressing and rolling until entire sheet is well bonded to substrate. Place anchor on top of sheet membrane and fasten through to stud. Size sheet material to extend approximately 1/2 inch (13 mm) beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to form an air-tight and weather-tight seal. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic (product acceptable to the air barrier manufacturer) to form an air-tight and weather-tight seal.

C. Sub-framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

D. Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer's written recommendations.
   1. Thermal Spacer Installation: Clip thermal spacer to Z-girt and fasten girt directly to substrate spacing as required to support gravity and wind loading of cladding but not more than 26 inches (660 mm) maximum on center vertically and 16 inches (406 mm) maximum on center horizontally.

E. Installation sequence for spacers, sub-framing, and insulation - Option 1:
   1. Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install thermal spacers and screws for first Z-girt / track. For subsequent girts:
      a. Fasten top spacer with single screw through Z-girt and spacer into substrate ensuring spacer can pivot for accurate alignment.
      b. Friction fit insulation in place before completing installation of remaining screws to secure Z-girt and thermal spacers.
      c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.
      d. Ensure insulation pieces are in contact with no linear gaps between spacers.

F. Installation sequence for spacers, sub-framing, and insulation - Option 2:
   1. Pre-punch or pre-drill holes in Z-girts and tracks to accommodate fasteners.
   2. Position Z-girts directly over thermal spacer before installation of fasteners.
   3. Completely install spacers, screws and sub-framing, prior to installing insulation.
   4. Friction fit insulation in place as follows:
      a. For semi-rigid insulation batts or boards, score or cut insulation down its centerline to 50 % maximum of its depth to enable fitting insulation in correct position.
      b. Fold edges of insulation board back to enable friction fitting in correct position. Position edges of partially folded board into space between girts and thermal spacers, and flatten partially folded board against substrate.

c. Ensure insulation is tightly fitted with sides of insulation slightly compressed at each insulation spacer.

5. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches (406 mm) maximum on center along centreline of insulation batts or boards and in accordance with insulation manufacturer's written recommendations.
   a. Use sufficient number of stick pins or retention devices to ensure insulation remains flat and in correct position.
   b. Use 3 minimum stick pins or retention devices for each 4 feet (1220 mm) long batt or board.
6. Ensure insulation pieces are in contact with no linear gaps between spacers.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

C. Maximum Variation From Dimensioned Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 07 46 23 - WOOD SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood siding with boards for interior walls.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's data on materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, and accessories; showing compliance with requirements, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

C. Samples: Submit three samples 12 by 12 inches (305 by 305 mm) in size illustrating profile and finish.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index of 26-75, smoke developed index of 0-450, when tested in accordance with ASTM E84.

2.02 WOOD SIDING MATERIALS

A. Grade lumber in accordance with the following:
   1. White oak: Grading rules of NHLA.

B. Board Siding: Cove shiplap, White oak, maximum moisture content of 10 percent.
   1. Size: Match dimensions of linear wall panels as selected in Section 07 46 10.
   2. Surface Texture: Sanded.

2.03 ACCESSORIES

A. Stain: Match Architect's sample.

B. Wood Sealer: Factory-applied, water-based polymer, water repellant sealer that reacts chemically with untreated, natural wood surfaces.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install siding in accordance with manufacturer's instructions.

B. Fasten siding securely in place, level and plumb.
   1. Arrange for orderly nailing pattern, blind nail except over trim.
   2. Install siding for natural shed of water.
   3. Position cut ends over bearing surfaces, and sand cut edges smooth and clean.

C. Install wood siding horizontally with edges and ends over firm bearing.
   1. Ship lap edges and ends.
   2. Nail at 12 inches (305 mm) on center.
   3. Miter external and internal corners.

D. Sand work smooth and set exposed nails and screws.

3.02 TOLERANCES

A. Maximum Variation from Plumb and Level: 1/4 inch per 10 feet (6 mm/3 m).

B. Maximum Offset from Joint Alignment: 1/16 inch (1.5 mm).

END OF SECTION

SECTION 07 50 00 - MEMBRANE ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roofing Assembly:
      a. Walk pads.
      b. Roof membrane.
      c. Cover board.
      d. Insulation Board Cricket/Saddle.
      e. Tapered insulation.
      f. Insulation.
      g. Air and vapor barrier.
      h. Deck sheathing.
   2. Substrate:
      a. Composite metal deck with structural concrete fill.
      b. Metal roof deck.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2022.

C. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2021.

D. ASTM D7877 - Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes; 2014.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. Product Data:
   1. Manufacturer's data needed to demonstrate compliance with the specified requirements.
      a. Provide copy of installer's application to membrane manufacturer for warranty.
      b. Provide membrane manufacturer's acceptance of notice of award / assembly letter, referencing components of roof covering assembly and warranty and windspeed coverage.
   2. No provision of manufacturer's data or instructions shall be deemed to modify any requirement of the Contract Documents without the written approval of the Architect issued as a Contract Modification.
   3. Catalog illustrations or shop drawings in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
   4. Warranty draft from membrane manufacturer.

B. Shop Drawings Prepared by Membrane Manufacturer:
   1. Demonstrate compliance with wind uplift requirements.
   2. Provide a roof plan showing layout of insulation board.
   3. Indicate width of perimeter strip and corners.
   4. Include fastener pattern or adhesive pattern, as applicable, for field, perimeter, and corners.
   5. Include detail drawings of securement of insulation board at perimeter of openings or penetrations.

C. Installer qualifications on membrane manufacturer's letterhead. Wording of letter shall demonstrate compliance with "Quality Assurance" article, specified below.

D. Schedule: Submit construction schedule indicating anticipated beginning and ending dates of the following tasks. Where work will be conducted independently in more than one area or zone, submit for each area or zone.
   1. Preapplication review.
   2. Preconstruction inspection.
   3. Membrane installation.

E. Field Reports:
   1. Preapplication review.
   2. Preconstruction inspection.
   3. Completion inspections.
   4. Leak test report.

F. Closeout Submittals:
   1. Contractor's Certificate of Final Inspection
   2. Manufacturer's Warranty.

1.04 QUALITY ASSURANCE

A. Membrane Manufacturer's Certification of Installer:
   1. Installer shall be a company licensed by or approved by the roofing materials manufacturer for materials specified in this section and for projects similar in scope of work and for manfuacturer's premium labor and material warranty.
   2. Licensing or approval shall have been in effect continuously for at least one year prior to the date of bid opening or, if none, the date of award of the general contract, for this Project.

B. Installer shall designate a single individual as project foreman who shall be on site at all times during installation. Installer shall designate key personnel of the on-site crew who shall be experienced in work of the type specified. Neither the foreman nor the key personnel shall be changed without the Architect's consent.

C. See Section 01 91 25 - Building Enclosure Commissioning for additional requirements.

1.05 PREINSTALLATION MEETINGS

A. Coordination Review: Before start of construction of surfaces to receive membrane and after Architect's approval of submittals, schedule a meeting with membrane installer including the foreman, installers of work adjacent to or which penetrates membrane, Architect, Owner's representative, and membrane manufacturer's representative.
   1. Review Contract Document requirements and membrane manufacturer's product data and application instructions.
   2. Identify any differences between contract requirements and manufacturer's recommendations or warranty requirements.
   3. Obtain the Architect's written approval of any deviations from contract requirements.
   4. Review procedures for substrate construction and preparation.
   5. Review locations of conduits, piping, etc. Review requirements for horizontal and vertical clearances between adjacent penetrations and curbs, corners, walls, or footings.
   6. Review coordination of related work, preliminary installation schedule, inspection and testing methods, and certifications.
   7. Review coordination of transition from roof flashing membrane to Section 07 25 10 Weather Resistant Barrier (Liquid-Applied) at parapets and roof edges.
   8. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with membrane installation, substrate construction, mechanical and electrical construction, and related work.

B. Substrate Review: Before start of work, schedule a meeting with membrane installer including the membrane installer's foreman, Architect, Owner's representative, and membrane manufacturer's representative.

1. Review each issue identified in the Substrate Preconstruction Review meeting.
2. Walk areas to review and discuss substrate preparation including repair.
   a. Unacceptable surfaces.
   b. Drainage, flatness, and slope.
   c. Penetrations.
   d. Curbs.
   e. Work performed by other trades which requires coordination with membrane system.
3. Verify that substrates that will receive the roofing system are complete and in place, including nailers, curbs, penetrations, and perimeter construction.
4. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with membrane work and related work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Roofing materials shall be delivered to the construction site no sooner than one day prior to the day those materials are installed. No more roofing system materials are to be stored on the roof than can be installed the same day.

B. Prior to the delivery and storing of any roofing system materials on site, the Contractor shall provide to the Owner a copy of the Contractor's written approval to the roofing installer to store materials on site in an enclosed and dry location. Under no circumstance shall materials be stored in open area(s) of construction under tarps, either plastic or canvas.

C. Each roll, bucket, package (as applicable) of material shall be bear the UL Listing / Classification Mark.

D. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

E. Store the products in a dry condition during delivery, storage, handling, installation, and concealment.

F. Protect materials from prolonged sunlight exposure.

1.07 PROJECT CONDITIONS

A. Complete the construction of substrates, including work which will penetrate membrane, before start of membrane installation.

B. Comply with manufacturer's recommendations regarding condition of the substrate to receive membrane, weather conditions before and during installation, and protection of the installed membrane system.

C. Do not install primer or other materials during wet weather, nor to damp substrates.

D. Do not install primer or other materials when ambient or substrate temperatures are less than 40 deg F (4.5 deg C).

1.08 SEQUENCING AND SCHEDULING

A. Schedule subsequent construction and coverings to occur as soon as practicable after membrane installation, testing, and acceptance in order to avoid traffic on membrane and to protect membrane from sunlight and damage.

1.09 WARRANTY

A. Manufacturer's Warranty: Provide membrane manufacturer's premium NDL (no dollar limit), non-prorated material and labor warranty covering the following:
   1. All materials specified in this section of the specifications.
   2. Failure of membrane manufacturer's materials to resist penetration of water.
      a. Penetration of water is defined to include:
         1) Penetration of water below the membrane
         2) Penetration of water into insulation below the membrane
         3) Penetration of water into the substrate.
         4) Penetration of water into the interior of building.

3. Partial or complete detachment of the membrane, of below-membrane insulation, or of board materials from each other or from substrates to which they are adhered or mechanically attached, up to a wind speed of 74 miles per hr (120 km/hr).
   a. Warranty language referencing "gale force" or "the Beaufort" scale is not acceptable.
4. Exclusions: Failure resulting from:
   a. Penetration of water through walls, parapets, and openings such as doors, windows, and louvers.
   b. Electrical, piping, and plumbing penetrations (other than drains) utilizing pitch pans.
   c. Structural failures of the building.
   d. Abuse.
   e. Work or alterations occurring after Final Completion of the Project.
   f. Acts of God.
   g. Other exclusions accepted by the Owner.
5. Hairline cracking of concrete is not considered a structural failure.
6. Warranty Term: Twenty year period after Date of Final Acceptance.

PART 2 PRODUCTS

2.01 ASSEMBLY REQUIREMENTS

A. Surface Burning: UL (DIR) / ITS (DIR) Class A roof covering.

B. Wind uplift:
   1. Design Wind Pressures for Components and Cladding: As indicated on the structural drawings.

2.02 MATERIAL REQUIREMENTS

A. Furnish materials provided a single company (the membrane manufacturer) and include in the membrane manufacturer's warranty, as follows:
   1. Materials manufactured or fabricated in the company's own facility.
   2. Materials manufactured or fabricated in another's facility under license from the company (third party label).
   3. Materials manufactured or fabricated by others but acceptable to the company for inclusion in the roofing system and the membrane manufacturer's warranty.

2.03 SINGLE PLY ROOFING SYSTEM

A. Thermoplastic Membrane Roofing: (Alternate)
   1. Fully adhered membrane installation.
   2. PVC Sheet: Comply with ASTM D4434/D4434M, Type III.
   3. Color: White.
   4. Duro-Last.
      a. Duro-Last X 80-Mil membrane, thickness: 0.080 inch (2.032 mm).
   5. Sika Sarnafil.
      a. Sarnafil G410-80 membrane, thickness: 0.080 inch (2.032 mm).
   6. Soprema.
      a. Sentinel P200 membrane, thickness: 0.080 inch (2.032 mm).

B. TPO Membrane Roofing (Base Bid)
   1. Fully Adhered Membrane Installation.
   2. Elevate Brand Firestone Building Products Company LLC.
      a. UltraPly Platinum TPO membrane, 0.080 inch (2.032 mm) thick.
      b. Color: White.
   3. Carlisle SynTec Incorporated.
      a. Sure-Weld membrane, 0.080 inch (2.032 mm) thick.
      b. Octa-Guard XT weathering technology.
      c. Color: White.
   4. Johns Manville.

a. JM TPO 80 membrane, 0.080 inch (2.032 mm) thick.
b. Color: White.

2.04 SHEET MATERIALS

A. Air and Vapor Barrier:
1. Product formulated for self-adhesive application to substrate.
a. Carlisle: VapAir Seal 725TR.
b. Duro-Last: Duro-Last Vapor Barrier.
c. Elevate: V-Force Vapor Barrier.
d. Johns-Manville: JM Vapor Barrier SAR.
e. Sika Sarnafil: Vapor Retarder SA 31.
f. Soprema: Elastophene Stick.

2.05 INSULATION AND BOARD MATERIALS

A. Cover Board:
1. Glass-mat-faced gypsum board: ASTM C1177/C1177M.
a. DensDeck Prime.
b. Thickness: 1/4 inch (6 mm).
c. Water Absorption (ASTM C473): Less than 5 percent of weight.
d. Surface Water Absorption (ASTM C473): Nominal 1.0 grams.
e. Compressive Strength (Applicable Sections of ASTM C472): Nominal 900 psi (6.20 MPa).

B. Polyisocyanurate Insulation: ASTM C1289:
1. Type II, Class 2 - coated polymer-bonded glass fiber mat facers.
2. Two layers of uniform thickness: Combined LTT R-value (RSI-value) of 30 (5.29).
3. Tapered insulation.
a. Slope as indicated on the drawings.
b. Slope: 1/4 inch per foot (21 mm per m).
c. Slope for crickets at equipment curbs: 1/2 inch per foot (42 mm per m).

C. Deck Sheathing:
1. Glass-mat-faced gypsum board: ASTM C1177/C1177M.
a. DensDeck Prime.
b. Thickness: 5/8 inch (16 mm).

2.06 PENETRATION AND PERIMETER MATERIALS

A. Penetration Flashings: Provide membrane manufacturer's standard thermoplastic boot for electrical conduit, piping, equipment posts, and other items that penetrate the membrane. Include same in membrane manufacturer's warranty.

B. Termination Bar: Membrane manufacturer's standard aluminum or formed stainless steel bar.

2.07 ACCESSORIES

A. Primer: Manufacturer's recommended type.

B. Cold Adhesive for Board Products: Type as recommended by membrane manufacturer.

C. Nailers: Specified in Section 06 10 00.

D. Fasteners for Base Flashing and around Penetrations: Type recommended by membrane manufacturer

E. Preformed inside and outside corners: for PVC membrane. Field-formed corners are not acceptable.

F. Other materials necessary for a complete system: As recommended by membrane manufacturer.

G. Walk pads: Manufacturer's recommended material.

PART 3 EXECUTION

3.01 GENERAL

A. Do not begin installation of roofing insulation or membrane until construction above the deck as well as the deck itself and nailers, blocking, penetrations, curbs, equipment supports, drains, vents, etc., have been completed and approved.

3.02 PREPARATION

A. Surface preparation, detailing procedures, and installation procedures shall be in accordance with this Specification and the Drawings and the manufacturer's instructions.

B. If manufacturer's installation instructions deviate from requirements of this section, obtain the Architect's written approval of deviations before proceeding.

C. Interruptions of Roofing Work:
   1. Install each component of roof covering in permanent, final form, before allowing materials to be exposed during precipitation or overnight.
   2. Do not use plastic cement or mastics as temporary measures to seal permanent work.
   3. Install temporary water cut-offs at the end of each working day. Remove and discard before resuming permanent work.

3.03 TEMPORARY PROTECTION COURSE FOR HORIZONTAL SURFACES

A. Do not allow construction traffic of any kind - whether pedestrian or vehicular - on surface of completed membrane without providing adequate protection.

B. Protection Boards for Construction Traffic:
   1. Where construction traffic on membrane is unavoidable, provide protection adequate to avoid damage of any nature to membrane, but in no case provide less than the level of protection specified below.
   2. Provide a base layer of EPS insulation.
   3. Provide 2 top layers of plywood and secure against displacement by traffic. Stagger joints between layers not less than 12 inches (305 mm).
   4. Remove protection board when no longer needed, and inspect the membrane for damage.
   5. Repair damage, if any, before proceeding.

3.04 SURFACE CONDITIONS

A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section, to avoid traffic by other trades on membrane, and to prevent damage to installed membrane.

3.05 EXAMINATION

A. Verify existing conditions before starting work.
   1. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of membrane system.
   2. Ensure that substrates are free of standing water, dirt and debris, loose material, voids, and protrusions or deformations which may inhibit application or performance of membrane
   3. Correct substrate surfaces that are unacceptable to the installer or fail to conform to the membrane manufacturer's printed instructions, unless otherwise approved by the membrane manufacturer's representative and the Architect.

B. Do not begin installation until plumbing, mechanical, and electrical items that penetrate membrane are complete and approved.

C. Verify items that penetrate surfaces to receive membrane are securely installed.

D. Verify conformance of Project Conditions with manufacturer's requirements and correct as required.
   1. Report unsatisfactory conditions in writing to the Architect.

2. Do not install membrane until substrate condition is acceptable to the Contractor, installer, and membrane manufacturer's representative and a written report of the preconstruction inspection has been approved by the Architect.

3.06 CONCRETE DECK PREPARATION

A. Ensure that concrete and masonry substrates are free of voids deeper than 3/8 inch (10 mm) and free of surface protrusions more than 1/4 inch (6 mm) above the surface.

B. Remove honeycomb, aggregate pockets, fins, ridges, and projecting rough areas. Correct surface texture that is either too rough or too smooth.

C. Apply 1 coat of primer at the recommended rate, and allow to dry.

3.07 METAL DECK PREPARATION

A. Ensure that metal deck has been inspected for conformance with structural requirements specified elsewhere.

B. Ensure that metal deck securement complies with wind uplift requirements.

3.08 DECK SHEATHING (AT METAL DECK)

A. Place deck sheathing directly on the structural deck.

B. Mechanically fasten deck sheathing. Space fasteners in field, perimeter, and corners of roof so as to comply with wind uplift requirements.

3.09 AIR AND VAPOR BARRIER

A. Prime the substrate as recommended by sheet manufacturer.

B. Install air and vapor barrier in accordance with manufacturer's instructions.

C. Ensure that air and vapor barrier is securely sealed to prevent the passage of air at laps, penetrations, and around the perimeter.

3.10 INSULATION AND COVERBOARD

A. Layout:
1. Layout end joints in a staggered pattern.
2. Layout subsequent layers of board so that joints in each layer are offset at least 6 inches (150 mm) from joints in previous layer.
3. Ensure that joints between adjacent boards are snug and are without voids or gaps.
4. Abut boards against perimeters and penetrations with not more than a 1/4 inch (6 mm) gap.

B. Provide crickets, saddles, and tapered areas to ensure positive slope to drain at all locations.

C. Place coverboard on top of insulation.

D. Adhere first layer in adhesive, following manufacturer's instructions.

E. Adhere subsequent layers in adhesive, following manufacturer's instructions.

3.11 SINGLE PLY MEMBRANE

A. Install in accordance with manufacturer's instructions and shop drawings.

B. Provide additional layer of “sacrificial” membrane under lightning protection system and ballasted photovoltaic panel supports. Coordinate location and attachment with system provider and include final installation under required warranty. See Section 26 41 14.

C. Install walk pads where indicated on Drawings and under downspout splash blocks.

3.12 FIELD QUALITY CONTROL

A. The membrane manufacturer's representative shall be present at the site to inspect substrates to receive membrane, during installation startup, to troubleshoot during installation when requested by the Architect or the Contractor, and to approve completed installation.

B. Prior to covering completed membrane with insulation or other materials, inspect all portions of the membrane and flashings.

C. Inspect membrane surface after water testing or after drenching rain to verify that no ponds remain after 24 hours in summer weather or 48 hours in winter or damp weather.

D. Leak Testing:
   1. The Owner will employ an independent testing agency to perform electronic leak detection in accordance with ASTM D7877. See Section 01 91 25 - Building Enclosure Commissioning for additional information.
   2. Perform testing before covering or overburden of any kind is placed on the roof.
   3. Perform testing after construction operations involving other trades is complete and correct and roof traffic is no longer required on the roof surface.
   4. Ensure that no materials or equipment are stored on the roof during testing. Provide unimpeded access to the entire surface.
   5. If breaches or defects in membrane are observed, identify the location of each.
   6. Report results.

E. Obtain the Architect's approval of the membrane prior to covering with other materials.

3.13 PROTECTION AND CLEANING

A. Take measures required to protect completed membrane after installation.

B. Do not permit traffic over unprotected or uncovered membrane.

C. Clean spillage and soiling from adjacent surfaces, using cleaning agents and procedures recommended by the manufacturer of the surface.

CONTRACTOR'S FINAL CERTIFICATE OF INSPECTION

I certify that I have inspected the work specified in this Section. I have inspected this work in its entirety prior to its concealment. No segment has been left uninspected. I have found this work to be complete and in accordance with the Contract Documents.

Certified this _____ day of _____, 20___, by

_____(signature)

_____(printed name) on behalf of

_____(Contractor).

END OF SECTION

SECTION 07 55 56 - VEGETATED ROOFING MEMBRANE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products include:
   1. Hot fluid-applied membrane waterproofing.
   2. Drainage layer.
   3. Insulation, 2 layers.
   4. Moisture retention mat.
   5. Filter fabric.
   6. Growth media.
   7. Applicable sealants, waterstops, waterproofing flashings, and accessories needed to ensure a complete waterproof system.

B. Apply waterproofing to the following surfaces:
   1. Plaza decks and other elevated traffic surfaces: Hot fluid-applied membrane waterproofing.

C. Alternates: Work of this section is affected by an Alternate. Refer to Section 01 23 00 – Alternates.

1.02 REFERENCES

A. ANSI/SPRI VF-1 - External Fire Design Standard for Vegetative Roofs, 2017.

1.03 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to demonstrate compliance with the specified requirements.
   2. Catalog illustrations or shop drawings in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
   3. For information (Project Record): Manufacturer's detailed installation instructions. No provision of such instructions shall be deemed to modify any requirement of the Contract Documents without the approval of the Architect, and issued as a Contract Modification.
   4. Warranty draft.
   5. Letter on membrane manufacturer's letterhead that lists each material included in the removal and replacement of overburden warranty.

B. Sustainability Documentation: Submit information required by Section 01 33 29.03.

C. Certificates:
   1. Installer qualifications.
   2. Vegetation and Overburden Certificate in the form included at the end of this Specification signed by the Membrane manufacturer.

D. Shop Drawings:
   1. Obtain shop drawings prepared by the membrane manufacturer for this Project.
   2. Indicate joint and termination conditions and interface with other materials.

E. Schedule: Submit construction schedule indicating anticipated beginning and ending dates of the following tasks. Where work will be conducted independently in more than one area or zone, submit for each area or zone. No area or zone shall consist of less than 5000 sq ft (465 sq m) without the advance approval of the Architect.
   1. Preapplication review.
   2. Preconstruction inspection.
   3. Preparation work.
   4. Membrane installation.
   5. Drainage system.
   6. Insulation.

7. Final surface covering such as ballast, pavers, soils, or other materials.

F. Submit reports signed by Contractor, installer, and waterproofing manufacturer's representative of:
1. Preapplication review.
2. Preconstruction inspection.
3. Membrane/substrate adhesive.
4. Completion inspections.
5. Kettle temperature log: Submit at the end of each week.

G. Warranty.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with at least 10 years documented experience and certified by the membrane manufacturer.
1. Certification:
a. Installer shall be a company licensed or certified by the waterproofing materials manufacturer for materials specified in this section and for projects similar in scope to work included.
b. Certification or licensing shall have been in effect continuously for at least one year prior to the date of bid or, if none, the date of award of the general contract, for this Project.
c. Certification or licensing shall qualify for manufacturer's premium labor and material warranty.
2. Installer shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity. Provide current phone contacts of Architects and Owners for verification.
3. Installer shall designate a single individual as project foreman who shall be on site at all times during installation. Installer shall designate key personnel of the on-site crew who shall be experienced in work of the type specified. Neither the foreman nor the key personnel shall be changed without the Architect's consent.

1.05 MOCK-UP

A. Prior to installation of membrane, construct mock-up to represent finished work.

B. Construct one mock-up for each type of installation specified. At a minimum provide the following mock-ups:
1. Field - 400 square feet
2. Substrate change - 20 linear feet
3. Flashings:
a. Field Seam: 50 linear feet
b. Parapet - 10 linear feet
c. Curb - 10 linear feet
d. Gravel Guard or Fascia - 10 linear feet
4. Drains - 1 of each type
5. Other conditions - 10 linear feet or 1 of each type

C. Locate where directed by Architect.

D. Show all aspects of the work of this Section to the quality specified.

E. Make necessary adjustments to each mock-up and secure the Architect's approval.

F. Approved mock-up may remain as part of the installation required for this work. Remove unacceptable Work

1.06 PREINSTALLATION MEETINGS

A. Substrate Review: Before start of construction of surfaces to receive membrane and after approved submittals have been received by the Contractor, schedule a meeting with membrane installer including the foreman, installers of work adjacent to or which penetrates membrane, Architect, Owner's representative, and membrane manufacturer's representative.

1. Review procedures for substrate construction and preparation.
2. Review Contract Document requirements for membrane and membrane manufacturer's product data and application instructions.
3. Review locations of conduits, piping, etc. Review requirements specified in Section 07 72 10 for horizontal and vertical clearances between adjacent penetrations and curbs, corners, walls, or footings.
4. Review coordination of related work, preliminary installation schedule, inspection and testing methods, and certifications.
5. Review Contract Document requirements and submittals for system, including installation schedule, inspection and testing, and environmental conditions.
6. Identify any differences between contract requirements and manufacturer's recommendations or warranty requirements.
7. Obtain the Architect's written approval of any deviations from contract requirements.
8. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with membrane installation, substrate construction, mechanical and electrical construction, and related work.

B. Membrane Preinstallation Review: Before start of work, schedule a meeting with membrane installer including the membrane installer's foreman, Architect, Owner's representative, and membrane manufacturer's representative.
   1. Review each issue identified in the Substrate Preconstruction Review meeting.
   2. Walk areas to review and discuss substrate preparation including repair.
      a. Unacceptable surfaces.
      b. Drainage, flatness, and slope.
      c. Penetrations.
      d. Curbs.
      e. Work performed by other trades which requires coordination with membrane system.
      f. Review fastening of insulation, flashings, drainage system, and other membrane components.
   3. Document discussion in writing, including issues requiring action, and distribute report to entities concerned with membrane work and related work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

B. Store the products in a dry condition during delivery, storage, handling, installation, and concealment.

C. Protect materials from prolonged sunlight exposure.

1.08 PROJECT CONDITIONS

A. Complete the construction of substrates, including work which will penetrate membrane, before start of membrane installation.

B. Comply with manufacturer's recommendations regarding condition of the substrate to receive membrane, weather conditions before and during installation, and protection of the installed membrane system.

C. Do not install primer or other materials during wet weather.

D. Do not install primer or other materials when air or substrate temperatures are below 40 degrees F.

E. Maintain substrate and ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquids, mastics, and adhesives have cured.

1.09 SEQUENCING AND SCHEDULING

A. Normal Weight Concrete: Install membrane not sooner than recommended by membrane manufacturer, but in no case sooner than 28 days after placement of concrete.

B. Schedule installation of liquid-applied membranes to occur when temperatures are within specified ranges.

C. Schedule subsequent construction and coverings to occur as soon as practicable after membrane installation, testing, and acceptance in order to avoid traffic on membrane and to protect membrane from sunlight and damage.

1.10 WARRANTY

A. Total System Warranty: Provide membrane manufacturer's premium material and labor warranty covering the vegetated green roof assembly, including membrane; drainage and moisture retention mats; flashing; insulation; soil edge retention devices separating soil areas and other areas; soil growth media; vegetation; and pavers.
   1. Correct defective work within a twenty year period after Date of Final Acceptance.
   2. Permissible exception: where penetration of water is the result of structural failure or defect. Hairline cracking of concrete is not considered a structural failure or defect for purposes of this warranty.
   3. For membrane warranty repair work, remove and replace materials concealing membrane, including:
      a. Drainage and moisture retention mats.
      b. Insulation.
      c. Pavers.
      d. Soil edge retention devices separating soil areas and other areas.
      e. Soil growth media.
      f. Vegetation.
   4. For warranty repair work, removing and replacing the following materials is the responsibility of the Owner:
      a. Precast concrete seating.
      b. Parapet cap.

B. Provide membrane manufacturer's material and labor warranty covering live vegetation, as follows:
   1. For a period of two years, remove and replace vegetation that fails to thrive or that fails to cover the vegetated area.
      a. Not less than 50 per cent of the vegetated area shall be covered by thriving vegetation at the end of 12 months.
      b. Not less than 80 percent of the vegetated area shall be covered by thriving vegetation at the end of two years.

C. By submitting a bid for this Work, Bidder warrants that Bidder has verified with the membrane manufacturer that the membrane manufacturer will provide the specified warranties for the membrane and vegetation without qualification upon satisfactory completion of the Work.

PART 2 PRODUCTS

2.01 HOT FLUID-APPLIED, RUBBERIZED ASPHALT MEMBRANE ROOFING

A. Manufacturers:
   1. American Hydrotech, Inc.; Monolithic Membrane 6125; www.hydrotechusa.com.
   2. Henry Company; 790-11 System: www.Henry.com.
   3. Carlisle Coatings & Waterproofing, Inc.; CCW-500 Hot Applied Membrane: www.carlisle-ccw.com.

B. Membrane:
   1. Modified asphalt bitumen, hot poured, formulated for thick application waterproofing uses.
   2. Cured Thickness: 215 mils (5 461 mm), minimum.
   3. Properties in the cooled (cured) state shall be as published in membrane manufacturer's literature that is current as of the date of publication of the Bidding Documents for this Project.

C. Accessories:
   1. Cap Sheet:
      a. American Hydrotech, Inc.; Hydrocap.
      b. Henry Company; NP180gT4 or NP180gM4.
      c. Carlisle Coatings & Waterproofing, Inc. waterproofing system:
         1) Provide copper sheet flashing extension, specified in Section 07 62 00, to conceal membrane materials.
         2) Extension: L-shaped with horizontal leg at least 4 inches (102 mm) and vertical leg to span from beneath insulation to mid-point of counterflashing above. Notch horizontal leg to allow for curvature required. Hem edges.
   2. Separation Sheet / Root Barrier:
      a. American Hydrotech, Inc.; Hydroflex RB II.
      b. Henry Company; ModifiedPLUS G100s/s Base Sheet plus ROOTBLOC 20.
      c. Carlisle Coatings & Waterproofing, Inc.; CCW Protection Board-HS plus CCW Root-Barrier (16 mil tightly woven HDPE Scrim with 2-mil polymeric coating on both sides).
   3. Termination Bar: Aluminum or type 304 stainless steel; 1/8 inch by 1 inch (3.2 mm x 25 mm), prepunched at 8 inches (203 mm) o.c.; stainless steel fasteners suitable for substrate.
   4. Fabric Reinforcement for Detailing and Flashings: Neoprene Sheet Flashing: 60 mils thick, uncured, by membrane manufacturer.
   5. Fabric Reinforcement for Membrane: Spunbonded, nonwoven polyester filter fabric; weight and porosity as recommended by membrane manufacturer.
   6. Primer: Membrane manufacturer's recommended solvent based primer.
   7. Neoprene Sheet Flashing: 60 mils thick, uncured, by membrane manufacturer.

D. Drainage Layer:
   1. 3/8" to 1/2" thickness three-dimensional drainage mat; style and type as recommended by membrane manufacturer.
   2. Filter fabric roll stock: In addition to wide rolls of drainage layer for use as overlay, provide 36 inch-wide filter fabric roll stock for envelopes, edges, and detailing of other conditions.
   3. Adhesive for insulation and drainage layer: As recommended by manufacturer. Do not penetrate membrane below grade.

E. Moisture Retention Mat
   1. American Hydrotech: Gardendrain GR30.
   2. Henry: Henry DB100 (not optional).
   3. Carlisle: CCW MiraDrain GR9400.

F. Filter Fabric: Highly permeable, nonwoven fabric, made of polypropylene, polyolefin, or polyester fibers or combination of them, that filters against particle erosion.

G. Growing Media: Engineered growing mix of lightweight mineral and organic compounds with depth as indicated.

H. Other Vegetated Roof Assembly Materials: Vegetation, etc., are specified in Section 32 93 00 - Plants.

2.02 ACCESSORIES

A. Temporary Protection Board: ASTM D 6506, Type 3; semirigid sheets of fiberglass or mineral reinforced asphaltic core, pressure laminated between two asphalt saturated, fibrous liners.
   1. Product:
      a. W.R. Meadows, Inc.; Protection Course PC-3: www.wrmeadows.com.
   2. Thickness: 1/4 inch (6.4 mm).

B. Insulation: Extruded polystyrene foam board; complying with ASTM C 578; 3 inch board thickness.
   1. Horizontal Application:
      a. 60 psi compressive strength; type VII.

2.03 STRUCTURAL SOIL/GROWTH MEDIA

A. Provide manufacturer's custom soil mix capable of supporting vigorous growth of specified vegetation on plans, meeting following requirements:
   1. Rated for "intensive" roof applications.
   2. Grain size distribution (ASTM F1632 Method B) – all values shall be adjusted to availability of local materials or special project conditions related to plant selection and/or environmental conditions.
      a. Clay fraction (<0.002mm) less than 3%
      b. Silt fraction (0.075-0.002mm) less than 12%
      c. Passing #200 sieve (0.075mm) less than 15%
      d. Pasing #60 sieve (0.25mm) 5-25%
      e. Passing #18 sieve (1.0mm) 20-50%
      f. Passing #10 sieve (2.00mm) 30-60%
      g. Passing 1/8-inch sieve 35-70%
      h. Passing1/4-inch sieve 60-95%
      i. Pasing 3/8-inch sieve 95-100%
   3. Density (ASTM E2399)
      a. Initial media density 55lbs-75lbs/cf
      b. Maximum media Density 76lbs-93lbs/cf
   4. Water/Air Management (ASTM E2399)
      a. Saturated water capacity greater than 40%
      b. Saturated air content greater than 10%
      c. Total pore space greater than 45%
   5. Water Permeability
      a. Hydraulic Conductivity greater than 10in/hr
   6. pH, Lime, and Salt Content
      a. pH (saturated paste) 6.0-8.0
      b. EC salts content (water extract) less than 3.0 mmhos/cm
   7. Organics (LOI 550°C) (ASTM F1647)
      a. Organic matter content 6-12%
   8. Compost Fraction
      a. Meet or exceed USEPA Class A standard, 40 CFR 503.13, Tables 1 & 3 (chemical contaminants) and 40 CFR 503.32(a) (pathogens) and/or be permitted in the state of origin to produce Class A material.
      b. Meet US Compost Council STA/TMECC criteria or equal for Class I or II stable, mature product.

2.04 VEGETATION AND OVERBURDEN MATERIALS

A. Vegetation and overburden materials are an integral part of the Work of this Section.

B. Vegetation and overburden materials shall be furnished by the Membrane manufacturer or furnished through the Membrane manufacturer according to the Membrane manufacturer's requirements and shall be included in the warranty specified in this Section.

C. The "waterproofing membrane assembly" shall be placed over the entire surface of the roof deck and shall consist of:
   1. The waterproof membrane and separation sheet embedded in the membrane.
   2. Drain mat placed on the membrane.
   3. Two layers of insulation, each of the thickness specified.
   4. Filter fabric overlay.
   5. Moisture retention mat.
   6. Filter fabric layers to confine soils.
   7. Soil/growth media.

D. Vegetation and overburden materials are those materials that are placed on top of the "waterproofing membrane assembly" in the locations indicated on the drawings. They consist of:
   1. Vegetation according to the planting schedule included elsewhere on the Drawings or Specifications.
   2. Soil retention edging to continuously separate growing media from other areas.

2.05 MATERIALS EXCLUDED FROM THE WORK AND WARRANTY OF THIS SECTION

A. Precast concrete elements. (The "waterproofing membrane assembly" shall run continuously underneath of the precast concrete elements.)

B. Parapet caps and coping materials. (The waterproofing membrane flashing shall extend underneath of caps and copings as indicated.)

PART 3 EXECUTION

3.01 GENERAL

A. Install work in compliance with ANSI/SPRI VF-1 - External Fire Design Standard for Vegetative Roofs.

B. Surface preparation, detailing procedures, and installation procedures shall be in accordance with this Specification and the Drawings and the manufacturer's instructions.

C. If manufacturer's installation instructions deviate from requirements of this section, obtain the Architect's written approval of deviations before proceeding.

D. Protect adjacent surfaces not designated to receive membrane.

E. Clean and prepare surfaces to receive membrane in accordance with manufacturer's instructions. Ensure that substrate is dry and free of dirt, dust, and debris.

F. Do not apply membrane to surfaces unacceptable to membrane manufacturer.

G. Provide drop cloths or masking as required to prevent spilling and soiling of adjacent surfaces not indicated to receive membrane.

H. Lay out project to determine and anticipate conditions prior to start of work.
   1. Note termination and penetration conditions to determine methods for creating a waterproof envelope. Verify that where below-grade waterproofing extends to grade, other waterproofing provides protection for substrate continuing above grade.

3.02 TEMPORARY PROTECTION COURSE FOR HORIZONTAL SURFACES

A. Do not allow construction traffic of any kind - whether pedestrian or vehicular - on surface of completed membrane without providing adequate protection.

B. Temporary Protection Boards for Construction Traffic:
   1. Where construction traffic on membrane is unavoidable, provide protection adequate to avoid damage of any nature to membrane, but in no case provide less than the level of protection specified below.
   2. Over separation sheet, provide 2 layers of protection board at horizontal surfaces subject to unavoidable temporary construction traffic. Stagger joints between layers not less than 12 inches.

C. Remove protection board when no longer needed, and inspect the membrane for damage.
   1. Repair damage, if any, before proceeding.

3.03 SURFACE CONDITIONS

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section and to prevent damage to installed membrane.

3.04 EXAMINATION

A. Verify existing conditions before starting work.

1. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of membrane system.
2. Ensure that substrates are free of standing water, dirt and debris, loose material, voids, and protrusions or deformations which may inhibit application or performance of membrane
3. Ensure that concrete and masonry substrates are free of voids deeper than 3/8 inch and free of surface protrusions more than 1/4 inches above the surface.
4. Ensure that the surface of concrete footings to receive the membrane are even and without abrupt changes in plane, with a wood float or better finish.

B. Substrate Tests:
1. Perform dryness tests recommended by membrane manufacturer.
2. Test adhesion of membrane to substrate using manufacturer's recommended test method or as otherwise directed by the Architect.

C. Surface Contaminants:
1. Verify that form release agents used on vertical surfaces are compatible with membrane products.
2. Verify that no membrane-forming curing compounds were used on horizontal or other surfaces.
3. Where curing compounds or incompatible form release agents have been used, remove by blast cleaning down to sound, clean substrate. Acid etching is not acceptable.

D. Do not begin installation until mechanical and electrical items that penetrate membrane are complete and approved.
1. Verify items which penetrate surfaces to receive membrane are securely installed.
2. Verify that the distance between individual penetrating items provides clear working distance to effectively install waterproofing. Clusters of penetrating items are not permitted.
3. Verify that penetrations and sleeves comply with the requirements specified in Section 07 05 10.

E. Verify conformance of Project Conditions with manufacturer's requirements and correct as required.
1. Report unsatisfactory conditions in writing to the Architect.
2. Do not install membrane until substrate condition is acceptable to the Contractor, installer, and membrane manufacturer's representative and a written report of the preconstruction inspection has been approved by the Architect.

3.05 PREPARATION FOR LIQUID WATERPROOFING

A. Complete the preparation work specified in this Article, and obtain the Architect's written acceptance of this work prior to installing membrane specified in this section.

B. Remove honeycomb, aggregate pockets, fins, ridges, and projecting rough areas.

C. Reinforced Detail Coating:
1. Rout or saw-cut cracks wider than 1/16 inch to a depth of 1/4 inch. Clean groove with compressed air or other suitable means.
2. Clean cracks less than 1/16 inch, joints, holes, depressions, and irregularities with compressed air or other suitable means.
3. Apply 1 coat of primer at the recommended rate to surfaces to receive detail coating, and allow to dry.
4. Fill cracks, construction joints, holes, depressions, and irregularities per membrane manufacturer's instructions.
5. Apply reinforced detail coating of liquid membrane extending 6 to 9 inches in all directions beyond cracks, joints, holes, depressions, and irregularities.

D. Vertical Surfaces at Curbs, Parapets, Walls, and Similar Projecting Elements: Install reinforced liquid membrane detail coating as follows:

1. Mask off or otherwise protect surfaces to receive sealants, expansion joint materials, or materials other than membrane.
2. Apply 1 coat of primer at the recommended rate to surfaces to receive liquid membrane detail coating, and allow to dry.
3. Extend liquid membrane detail coating onto deck not less than 6 inches.
4. Vertical projections:
   a. Curbs less than 24 inches high: Extend liquid membrane detail coating vertically to full height of curbs and across top of curbs and similar projecting elements to join with other building envelope systems.
   b. Parapets 24 inches high and greater: Extend liquid membrane detail coating reinforcement up vertically not less than 6 inches.
5. Laps: Lap edges not less than 4 inches. Lap ends not less than 6 inches. Form inside and outside corners in accordance with manufacturer's instructions.

E. Drains: Install reinforced liquid membrane detail coating into drain bowl and extending beyond drain onto the deck in accordance with manufacturer's instructions. Reinforcement: Neoprene, fabric, or modified bitumen as instructed by membrane manufacturer.

F. Areas to Receive Membrane: Apply 1 coat of primer at the recommended rate to surfaces to receive membrane, and allow to dry.

3.06 HOT FLUID-APPLIED MEMBRANE APPLICATION

A. Complete the preparation Work specified in the previous Article, and obtain the Architect’s written acceptance of of such Work prior to installing membrane specified in this Article.
   1. If membrane is inadvertently installed prior to completing such preparation, do not request acceptance: remove the membrane materials down to bare, clean, concrete deck; obtain the Architect’s approval of concrete deck; complete preparation Work as specified; obtain the Architect’s approval of preparation Work; all before beginning anew the installation of the membrane.

B. General:
   1. Complete preparation specified above before installing membrane.
   2. Comply with membrane manufacturer's installation instructions.
   3. If manufacturer's standard installation instructions deviate from requirements of this section, obtain the Architect's written approval of deviations before proceeding.

C. Heating of Bitumen: Use equipment approved by membrane manufacturer. Heat bitumen only enough to allow even application at required thickness and in any case within membrane manufacturer's recommended temperatures. Do not heat bitumen above flash point less 25 degrees F. Do not hold at elevated temperature for extended periods of time.
   1. Maintain a log of bitumen temperature in kettle showing date, time, and temperature. Record readings hourly. Submit to the Architect, if requested.

D. Application: Apply hot rubberized asphalt bitumen in two coats with intervening reinforcing fabric, using methods approved by membrane manufacturer. Minimum average thickness: 215 mils (0.215 inch).

E. Extend reinforced membrane across detail coatings and curb, parapet, or similar projecting element to join with other building envelope systems. Detail coatings shall be fully coated with liquid membrane.

F. Install separation sheet in hot membrane; extend over entire membrane surface.

G. Install granulated cap sheet wherever membrane would be exposed to UV light.

H. Where separation sheet and root barrier are separate products, install root barrier in accordance with manufacturer’s instructions; extend over entire membrane surface.

3.07 DRAINAGE LAYER AND INSULATION

A. Place drainage layer against membrane separation sheet, then cover with insulation in the following applications:

1. Roof coverings of vegetation, concrete unit pavers, cast-in-place concrete, structured seating.
2. Other locations indicated on the drawings.

3.08 DRAINAGE LAYER

A. Install drainage layer over entire surface. Butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Install drainage layer to ensure continuity of drainage to drains.

C. At perimeter of drainage layer, envelop core of drainage panel with filter fabric to prevent soil, sand, and fines from entering core. Install 1/2 of roll width of filter fabric against soil/aggregate interface and 1/2 roll width of filter fabric on top of drainage layer. Adhere filter fabric envelope with adhesive.

3.09 INSULATION INSTALLATION

A. Install insulation over entire surface.
1. Place 2 layers of insulation. Stagger edge and end joints between layers.
2. Lay with joint tightly butted; in no case leave more than 3/8 inch gap.
3. Stagger end joints between adjacent rows.
4. Cut and trim boards to fit snugly at edges, projections, and penetrations other than drains. Do not leave more than 3/4 inch gap.
5. Cut back insulation a distance of 6 to 8 inches from drain bowls.

B. Install filter fabric overlay over insulation boards; lap ends and edges a minimum of 12 inches.
1. Layout fabric such that edge laps do not occur within 6 feet of perimeter.
2. Envelop perimeter of insulation board; tuck at least 12 inches of fabric under insulation edge.
3. Extend fabric 4 to 6 inches above ballast at penetrations.
4. Extend fabric up to, but not up on drain strainers.
5. Arrange fabric at drains and penetrations to contain aggregate. Hold back insulation approximately 8 inches from edge of drain bowl, continue filter fabric up to edge of bowl but not up sides of bowl.

3.10 MOISTURE RETENTION MAT

A. Where built-up insulation thickness is shown on the drawings, provide additional layers of insulation to achieve soil depths and finished grades indicated.

B. Install in accordance with manufacturer's instructions.

3.11 VEGETATION AND OVERBURDEN MATERIALS

A. After the waterproofing membrane assembly is installed and completed over the entire surface of the roof, install growth media, vegetation, and overburden materials as indicated on the Drawings.

3.12 FIELD QUALITY CONTROL

A. The membrane manufacturer's representative shall be present at the site to inspect substrates to receive membrane, during installation startup, to troubleshoot during installation when requested by Architect or Contractor, and to approve completed installation.

B. Prior to covering completed membrane with insulation or other materials, inspect all portions of the membrane and flashings.

C. Electronic Vector Mapping:
1. Make arrangements for and pay for the services of an independent testing service to perform electronic vetor mapping of the entire roofing surface.
2. Perform mapping after all roof membrane operations are completed and after the roofing manufacturer's inspection and repairs, if any, are made.
3. Perform mapping after other roof-top or roof-zone construction operations are completed including, but not limited to:
a. Installation of mechanical equipment.

b. Installation of lightning protection equipment.
c. Installation of adjacent wall cladding.
d. Completion of any and all activities that take place over or above or on the roof or that require traffic on the roofing membrane, excepting vegetation and overburden materials.

4. Perform mapping before covering the membrane with other materials such as insulation, filter fabric, and pavers.
5. If membrane breaches are found:
   a. Report breaches; show approximate locations on roof plans.
   b. Repair breaches.
   c. Retest.
6. Submit written report to the Architect.

3.13 PROTECTION AND CLEANING

A. Take measures required to protect completed membrane after installation.

B. Do not permit traffic over unprotected or uncovered membrane.

C. Clean spillage and soiling from adjacent surfaces, using cleaning agents and procedures recommended by the manufacturer of the surface.

VEGETATION AND OVERBURDEN CERTIFICATE

We the undersigned certify that the vegetation and overburden specified in PART 2 of this Specification will be furnished in accordance with our requirements. We affirm that when the waterproofing membrane assembly Work of this section is complete in accordance with our requirements and the vegetation and overburden Work of this section is complete in accordance with our requirements, we will issue the warranty or warranties in our own name and in accordance with the warranty requirements specified in this Section.

Certified this _____ day of _____, 20__ by

_____(signature)

_____(printed name) on behalf of

_____(membrane manufacturer)

CONTRACTOR'S FINAL CERTIFICATE OF INSPECTION AND NOTICE OF READINESS FOR FINAL INSPECTION

I certify that I have inspected the work specified in Section 07 5030 - Vegetated Roofing Membrane. I have inspected this work in its entirety prior to its concealment. No segment has been left uninspected. I have found this work to be complete and in accordance with the Contract Documents. Certified this _____ day of _____, 20___, by

_____(signature)

_____(printed name) on behalf of

_____(Contractor).

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Sheet metal flashing, trim, closures, covers, clips, etc.
   2. Sheet metal fascia.
   3. Fasteners and attachment devices.
   4. Joint sealants in contact with work of this Section.

1.02 REFERENCES

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

D. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.03 SYSTEM DESCRIPTION

A. Sheet metal work includes exposed and concealed flashing, trim, and other sheet metal fabrications specified in this section, indicated on the Drawings, and as required by project conditions. Only the general arrangement and configuration of sheet metal work is indicated on the drawings.

B. Fabricate join, and fasten sheet metal work in conformance with manufacturer's recommendations and SMACNA (ASMM) recommendations to accommodate the project conditions on the site, and without change in Contract Time or Price. Such details shall conform to the SMACNA (ASMM) recommendations for maximum life and reliability.

C. Such details shall provide:
   1. Expansion provisions for running work.
   2. Sheet metal work that can reasonably be expected to be leak-free for at least 20 years without maintenance.
   3. Weather-proof performance without relying on sealant.
   4. Exception: Where the use of joint sealant is required by the Contract Documents or is required by Project conditions and is approved in writing by the Architect.

D. Seams and Joints: Where specific types of seams and joints are not indicated in the Contract Documents, select seams and joints in the order that follows:
   1. Provide locked seam or joint where, due to slope and interlocking of seam, the seam or joint is inherently weather-proof without the use of solder or sealants.
   2. Provide locked and soldered seam or joint where slope and interlocking of seam would allow water penetration, and where rigid construction is required. Prepare edges to be seamed, form seams, and solder.
   3. Provide sealant-filled expansion seams or joints only where lapped or bayonet-type expansion provisions in work cannot be used, or would not be water-and-weather-proof Obtain the written authorization of the Architect in each case. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant concealed within joints.

E. Fastening:
   1. Employ concealed cleats to fasten sheet metal to the substrate.
   2. Do not fasten exposed fabrications directly to the substrate unless explicitly required by the Specifications or the Drawings.
   3. Employ concealed fasteners. Obtain the Architect’s written authorization where exposed fasteners are proposed.
   4. Ensure exposed fasteners are permanently sealed against water penetration.

1.04 SUBMITTALS

A. Product Data for each material.

B. Installer qualifications: Submit for Architect's approval within the time limits specified.

C. Shop Drawings:
   1. Metal component profiles.
   2. Joints and seams.
   3. Joint and seam pattern.
   4. Fastening methods.
   5. Accessory items.
   6. Relationship of materials to adjacent construction.

D. Metal Samples.

1.05 QUALITY ASSURANCE

A. Installer: A company with at least 15 years of experience with installing products included in this section and which has completed at least 20 installations similar in scope to work included in this section.
   1. Submit the names of at least 3 projects within 30 miles (48 km) of the project site. Include project name, date of completion, name and telephone of owner contact, name and telephone of architect contact.
   2. Submit within the time limits specified in the Bidding Requirements and General Conditions.

B. Preconstruction Mock-ups:
   1. Construct mock-ups so as to demonstrate on site all aspects of preparation, fabrication, and installation of sheet metal work and its relationship to adjacent materials.
      a. Provide metal flashings and trim for mock-ups specified in other Specification Sections such as wall cladding, windows and glazing, and roofing.

C. Quality Standard:
   1. Fabricate and install metal work in accordance with recommendations SMACNA (ASMM).

1.06 DELIVERY, STORAGE AND HANDING

A. Follow metal manufacturer's recommendations for avoiding staining and marring of sheets.

B. Do not allow traffic of any kind on work.

1.07 WARRANTY

A. Manufactured Products: Provide manufacturer's standard warranty for copings and fascia; not less than 20 year duration.

PART 2 PRODUCTS

2.01 MATERIALS

A. Prefinished Aluminum Sheet: ASTM B209; Kynar (Hylar) coated.

B. Stainless Steel Sheet: ASTM A666; Type 304; 2B finish.

2.02 ACCESSORY MATERIALS

A. Fasteners for Manufactured Products: Type, style, and configuration suitable for Project substrates; provided by manufacturer.

B. Fasteners for Job Fabrications:
   1. Fasteners for Masonry Substrates: Type 304 stainless steel expansion type fasteners requiring pre-drilled hole. Powder or impact type fasteners not acceptable.
   2. Fasteners for Steel Substrates: Self-drilling, self-tapping screws with hardened carbon steel tip, Type 304 stainless steel shank. Provide dome head with neoprene washer where exposed fasteners are approved in writing by the Architect.

C. Sealants in contact with Work of this Section:

1. Concealed joints.
    a. Mastic sealant: Butyl sealant as specified in Section 07 92 00 - Joint Sealants.
    b. Butyl polyisobutylene sealant tape: As specified in Section 07 92 00 - Joint Sealants.
2. Exposed joints: Silicone as specified in Section 07 92 00 - Joint Sealants.

2.03 MANUFACTURED PRODUCTS

A. Provide products manufactured and tested in accordance with SPRI ES-1.

B. Products fabricated by the installing contractor or others may be submitted for the Architect's approval subject to all of the following:
1. Proposed substitutions are submitted in accordance with procedures specified elsewhere and within the time limits specified therein.
2. Proposed products actually produced by the proposed fabricator have been tested in accordance with SPRI ES-1 and demonstrate the required wind resistance.
3. Substitution requests shall be accompanied by reports of tests conducted by an independent testing laboratory demonstrating that the fabricator is certified to produce SPRI ES-1 rated product and that product meets the required wind resistance in accordance with SPRI ES-1.
4. Where spring-snap-on style covers are specified, crimp-on style covers are not acceptable.
5. Where products without exposed fasteners are specified, fabrications with exposed fasteners are not acceptable.

C. Materials:
1. Concealed cleats, chairs, and other supports: hot dip galvanized steel.
2. Exposed metal: Kynar (Hylar) coated aluminum.

D. Manufacturers:
1. Basis of Design: Metal-Era; www.metalera.com.
2. Other Acceptable Manufacturers.
    a. OMG Roofing Products Inc; www.omgroofing.com.
    b. SAF Perimeter Systems; www.saf.com.

E. Fascia: Snap-on type without field crimping or exposed fasteners.
1. Exterior face height: As required to extend leg not less than 1 inch (25 mm) lap over exterior wall cladding.
2. Metal Era: Anchor-Tite Standard Fascia.
    a. Extruded aluminum anchor bar / retainer.
    b. Inside and outside miters.

2.04 JOB FABRICATIONS FOR LOW-SLOPE ROOFS

A. Two-piece receiver and counterflashing for base flashing of low-slope roofs.
1. Stainless steel.
    a. Aluminum, Kynar (Hylar) coated where indicated on Drawings.
2. Configuration: set into masonry, cladding, or surface-applied as indicated on the Drawings.
3. Fasteners to secure counterflashing to receiver: 3/8-inch diameter dome head with neoprene washer, Type 304 stainless steel head and shaft, with carbon steel self-drilling tip.
4. Fasteners for securing receiver to steel back-up: #12 screws with Type 304 stainless steel head and shaft, carbon steel self-drilling tip.

2.05 JOB FABRICATIONS FOR WALL CLADDING

A. Flashing for wall cladding at windows, openings, story lines, panel edges, etc. as indicated on Drawings.
1. Stainless steel.
    a. Thickness: 26 gauge, 0.016 inch (0.4 mm).
2. Aluminum, Kynar (Hylar) coated.

2.06 OTHER FLASHINGS

A. Miscellaneous sheet metal flashing, trim, closures, covers, clips, etc. as indicated on Drawings.
   1. Stainless steel; 26 gauge, 0.016 inch (0.4 mm).
   2. Aluminum, Kynar (Hylar) coated; 0.032 inch (0.8 mm) thick.

B. Backing Strip: Galvanized steel sheet metal, 24 gauge, 4 inches (100 mm) wide.

2.07 FINISHES

A. Kynar (Hylar) Coating:
   1. Color: Custom color to match aluminum framing specified in Division 08.

2.08 FABRICATION

A. Shop and Field Fabrication:
   1. Shop fabricate work to the greatest extent possible.
   2. Form work to fit substrate.
   3. Form sheet metal to match profiles indicated, substantially free from oil-canning, buckling, tool marks, fish-mouths, and other defects.

B. Fasten sheet metal with concealed cleats. Fabricate cleats and attachment devices from same material as sheet metal component being anchored. Employ exposed fasteners only where and if specifically approved in writing by the Architect.

C. Form a 1/2 inch (13 mm) hem on underside of exposed edges.

D. Fabricate components to match profiles and details indicated and to ensure permanently leakproof construction. Provide for thermal expansion of sheet metal.

PART 3 EXECUTION

3.01 BACKING STRIP FOR SURFACE-FASTENED FLASHINGS

A. Flashings applied over studs and sheathing require a solid framing member to fasten to. Do not fasten flashings to sheathing alone.

B. Where framing between studs is already present at the location to receive surface-fastened flashings, no backing strip is required.

C. When stud framing installation is complete and before installing gypsum sheathing, examine each location where termination bars, flashings, or other sheet metal items will be fastened. Where continuous framing is not present, install backing strip to face of studs in a continuous fashion.

3.02 EXAMINATION

A. Examine substrates and conditions under which products of this section are to be installed and verify that work may properly commence. Do not proceed with the work until unsatisfactory conditions have been fully resolved.
   1. Verify that nailers, blocking, and other attachment provisions for sheet metal work are properly located and securely fastened to resist effects of wind and thermal stresses.

3.03 PREPARATION

A. Coordinate sheet metal roofing with other sheet metal work and substrate construction to provide a complete and permanently water-tight installation.

B. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Clean surfaces to receive sheet metal work. Verify that substrates are smooth and free of protrusions, irregularities, or other defects.
   1. Drive nails or other fasteners flush with substrate.

D. Coat the back side of metal with bituminous coating where it will be in contact with wood, dissimilar metal, or cementitious construction unless surfaces will be separated by self-adhesive underlayment or similar material.

3.04 INSTALLATION

A. Comply with recommendations of SMACNA (ASMM).

B. General:
   1. Fabricate and install work with lines and corners of exposed units true and accurate.
   2. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal.
   3. Provide uniform, neat seams with minimum exposure of solder and sealant.
   4. Fold back sheet metal to form a hem on concealed side of exposed edges.
   5. Conceal fasteners and expansion provision where possible in exposed work, and locate so as to minimize possibility of leakage.
   6. Cover and seal fasteners and anchors.

3.05 SEAMS AND JOINTS

A. General: Wherever practicable select joints that are permanently, inherently weather-tight and allow for thermal movement, and do not rely on solder or sealant for their integrity. Otherwise, use soldered joints wherever movement is not essential (except where aluminum or Kynar metals are required). Avoid the use of sealant joints except where movement must be accommodated.

B. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be water-and-weather-proof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant concealed within joints.

C. Sealant Joints: Where movable, non-expansion-type joints are indicated or required for proper performance of roofing, form sheet metal to provide for proper installation of elastomeric sealant as recommended by referenced standards.

D. Moving Joints:
   1. When ambient temperature is moderate (40 - 70 deg F (4.5 - 21 deg C)) at time of installation, set joined members for 50 percent movement either way.
   2. Adjust setting position of joined members proportionally for temperatures above 70 deg F (21 deg C).
   3. Do not install sealant at temperatures below 40 deg F (4.5 deg C).
   4. Refer to section on sealants elsewhere in Division 07 for handling and installation requirements for joint sealers.

3.06 CLEANING AND PROTECTION

A. Repair or replace work which is damaged or defaced, as directed by the Architect.

B. Remove from sheet metal surfaces any debris or substances which will inhibit uniform weathering.

C. Protect sheet metal work as recommended by the installer so that completed work will be clean, secured, and without damage at Final Acceptance.

END OF SECTION

SECTION 07 65 00 - FLEXIBLE FLASHING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Self-adhesive sheet flashing.

1.02 SYSTEM DESCRIPTION

A. Install sheet materials to form a secondary weather barrier to direct water penetrating the exterior skin down and out to the exterior.

B. Extend sheet materials across joints and seams in similar and dissimilar substrates and around doors, windows, and other openings to form a continuous barrier against intrusion of water and air.

1.03 SUBMITTALS

A. Product Data: Indicate material characteristics, performance criteria, and limitations.

B. Manufacturer's Installation Instructions: Indicate preparation, installation methods, storage requirements, and temperature limitations during and after installation.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Reports: Submit reports signed by Contractor and installer of:
   1. Preapplication review.
   2. Preconstruction inspection.
   3. In-progress inspections.
   4. Completion inspections.

1.04 QUALITY ASSURANCE

A. Preapplication Review: Schedule a meeting before start of installation with installer and waterproofing manufacturer's representative to review procedures for substrate preparation and waterproofing application.
   1. Review contract document requirements, manufacturer's product data, and application instructions.
   2. Manufacturer’s representative shall instruct first-time installers in proper installation procedures, and shall be available throughout project for trouble shooting upon request.

B. Install sheet materials in mock-ups specified elsewhere.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer’s original unopened containers.

B. Store containers in a dry location at temperatures under 100 deg F (38 deg C). Do not double-stack pallets.

C. During cold weather installation (under 60 deg F (15.5 deg C)), store sheet in heated enclosure (70 to 90 deg F (21 to 32 deg C)) 12 hours prior to installation; Remove only such material as is needed for immediate use.

D. Do not install material when substrate temperature is under 40 deg F (4.5 deg C) unless special procedures recommended by the manufacturer are followed and successful adhesion is obtained and mock-ups are approved by the Architect.

E. Do not expose to sunlight for more than 30 days, either when in storage or after installation, before covering with subsequent construction.

1.06 SEQUENCING

A. Backing Strip: Ensure that backing strip is installed before installing gypsum sheathing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Modified Asphalt Flashing:
   1. Composite material: 40 mils (1.0 mm) nominal thickness.
   2. Release sheet to protect adhesive layer.
   3. Product:
      a. Carlisle Coatings & Waterproofing Inc.; CCW-705-TWF.
      b. GCP Applied Technologies; Perm-A-Barrier Wall Flashing.
      c. Henry: Blueskin TWF.

B. Modified Asphalt Coping Underlayment:
   1. Composite material: Heat-resistant rubberized asphalt bonded to high strength polyethylene film; 40 mils (1.0 mm) total thickness.
   2. Release sheet to protect adhesive layer.
   3. Product:
      a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT Water & Ice Protection Self Adhering Roofing Underlayment.
      b. GCP Applied Technologies; Ice & Water Shield HT.
      c. Henry: Blueskin RF200 Ice & Water Barrier.

C. Termination Mastic:
   1. Trowel or caulking grade rubberized asphalt-based mastic.
   2. Products:
      a. Carlisle Coatings & Waterproofing Inc.; CCW-704 Mastic.
      b. GCP Applied Technologies; Bituthene Mastic.
      c. Henry: Air-Bloc 06 Trowel Grade.

D. Solvent Base Primer for Modified Asphalt Flashing:
   1. Rubber-based, solvent dispersed liquid for substrate preparation.
   2. Products:
      a. Carlisle Coatings & Waterproofing Inc.; CCW 702 Primer.
      b. GCP Applied Technologies; B2 Low VOC Content Primer.
      c. Henry: Blueskin Primer.

E. Metal Edge:
   1. Stainless steel, Type 304, 0.018 inch (0.45 mm) thick, with 2B finish.
   2. Size to align flush with face of construction, and to extend 4 inches (100 mm) nominal across masonry wythe.
   3. Provide 3/8 inch (10 mm) hem on outside edge.

F. Carrier Sheet: Provide where self-adhesive sheet spans the cavity or other gap in construction.
   1. Same material as metal edge.

G. Sealant: Specified in Section 07 92 00.

H. Termination Bar: Extruded aluminum or formed stainless steel, pre-punched with slotted holes at 8 inches (200 mm) o.c. for fasteners.
   1. Fasteners for bar on stud back-up: For steel studs #12 screws with Type 304 stainless steel head and shaft, carbon steel tip; for wood studs Type 304 stainless steel nails or screws.
   2. Fasteners for bar on concrete or masonry back-up: Stainless steel drive pins with lead expansion shields.

I. Backing Strip: Galvanized steel sheet metal, 24 gauge, 4 inches (100 mm) wide.

PART 3 - EXECUTION

3.01 BACKING STRIP

A. When stud framing installation is complete and before installing gypsum sheathing, install backing strip to face of studs in a continuous fashion, directly behind the location where termination bars, head flashings, or other sheet metal items will be fastened.

3.02 EXAMINATION AND PREPARATION

A. Review installed substrate surfaces for compliance with preparation requirements. Document necessary actions for correcting unacceptable surface conditions.

B. Verify that surfaces are smooth, sound, clean, and dry, and that components which will penetrate self-adhesive sheet are complete and rigidly installed.

C. Temperature: Install primer and sheet when temperature of substrate is 40 deg F (4.5 deg C) or above.

D. Do not install sheet until substrate condition is acceptable to the Contractor, installer, and sheet manufacturer's representative.

E. Concrete Substrates:
   1. Verify that form release agents or curing compounds used on surfaces are compatible with sheet products.
   2. Where incompatible products have been used, remove in accordance with sheet manufacturer’s instructions.
   3. Remove dust and chalk from substrates by dry brushing or pressure washing. Allow surface to dry thoroughly.
   4. Remove and repair honeycomb, aggregate pockets, fins, ridges, and projecting rough areas.
   5. Apply primer on same day as sheet installation, and allow to dry.

F. Concrete Unit Masonry Substrates:
   1. Flush masonry joints on wall face to receive membrane, and parge coat (one part portland cement; three parts sand) or other method of filling voids in concrete block is required.
   2. Allow ample time, never less than 1 day, for mortar to harden prior to installing sheet.
   3. Remove dust and chalk from substrates by dry brushing or pressure washing. Allow units to dry thoroughly.
   4. Apply primer, and allow to dry. On same day as primer installation, install membrane.

G. Sheathing Substrates:
   1. Remove dust from substrates by dry brushing.
   2. Apply primer and allow to dry.

H. Metal Substrates: Columns, structural beams etc.
   1. Ensure that surface is clean and free of dust, oils, or other contaminants.
   2. Apply primer, and allow to dry. On same day as primer installation, install membrane.

I. Steel Lintels, Shelf Angles and Masonry to Receive Metal Edge or Sheet Flashing:
   1. Ensure 100% solid units have been used or that cores of units have been filled flush with mortar to top of units.
   2. Allow ample time, never less than 1 day, for mortar to harden prior to installing sheet.
   3. Remove dust and chalk from substrates by dry brushing. Allow units to dry thoroughly.
   4. Apply primer, and allow to dry. On same day as primer installation, install membrane.

3.03 INSTALLATION

A. General:
   1. Precut pieces of sheet to required size for proper installation and ease of handling.
   2. Remove release paper and position sheet against substrate.
   3. Press entire surface area of sheet firmly against substrate using 6 inches (150 mm) steel hand roller on flat surfaces, or by burnishing with blunt tool such as back of a utility knife

on small areas and corners. Continue operation until entire sheet is well bonded to substrate.

4. Plan installation generally from bottom to top. Overlap adjacent pieces 2 inches (50 mm), forming laps that shed water, not dam water.
5. Roll or burnish laps to ensure complete adhesion.
6. Apply a bead of mastic on laps and perimeter of sheet.
7. Seal unavoidable penetrations with mastic.
8. Do not contaminate substrates to receive sealant with primers, surface conditioner, or self-adhesive sheet material.
9. Apply mastic on top of sheets, only. Do not apply sheet on top of mastic.

B. Flashing:
1. Whether or not specifically indicated, install flashing at all conditions such as lintels and shelf angles where the downward flow of any water within the wall will be interrupted, so that such water will be diverted to the exterior. Extend flashings full width of lintels, shelf angles, and such obstructions and onto adjoining construction, and turn up to form watertight pan. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Seal lapped ends and penetrations of flashing before covering with subsequent materials.
2. Heads and Sills: Turn up ends of flashing at least 2 inches (50 mm) at heads and sills to form a pan, and seal joints.
3. Form end dams at the end of each run of flashing so as to direct water to the exterior.
4. Seal top of flashing with mastic.

C. Metal Edge:
1. Extend metal edge full width of flashing.
2. In masonry construction install metal drip edge flush with outside face of masonry.
3. Provide 1/4 inch (6 mm) gap between ends of metal drip edge to allow for expansion and contraction.
4. Set metal drip edge in 2 continuous beads of sealant. If permanent masonry is not placed immediately, weight the metal edge with masonry units until it reaches initial set so as to fully compress the sealant. Do not disturb metal edge until sealant is well set.
5. Lap flexible flashing on top of metal within mortar joint. Hold membrane back 1/2 to 1 inch (13 to 25 mm) from face of masonry.
6. Protect exposed metal edge from bending or other damage.

D. Masonry Through-Wall Flashings: Bring completely through inner wythe and turn up where concealed by other construction; otherwise stop not more than 1/2 inch (13 mm) from inner face. Drop flashing at least 4 inches (100 mm) before bringing through outer wythe.

E. Masonry Veneer Flashings: Turn flashings up not less than 8 inches (200 mm) at backup.

F. Non-masonry flashings:
1. Unsealed joints: Extend flashing to within 1/4 inch (6 mm) of face of construction.
2. Sealed joints: Extend flashing to within 1/4 inch (6 mm) of rear face of sealant joint. Do not extend flashing onto substrate to receive sealant unless specifically directed.
3. Turn flashings up not less than 4 inches (100 mm) at backup.

G. Head Flashing above Windows, Doors, Louvers, and Other Openings:
1. Mechanically fasten sheet metal head flashing to substantial substrate such as backing strip, studs, header, or masonry.
2. Modified Asphalt Flashings: Seal the sheet metal flashing to the weather-resistant barrier with a strip of modified asphalt flashing. Apply pressure to the entire surface of flashing to securely and permanently adhere the flashing to the substrate. Apply termination mastic to the perimeter edge of the modified asphalt flashing.

H. Coping Underlayment: Install heat-resistant flashing under copings, placed so as to unite with roofing membrane and weather-resistant membrane on wall to form a complete air and weather barrier.

I. Termination Bar: Install termination bar where top of modified asphalt flashings terminate against back-up construction. Secure bar to back-up with mechanical fasteners at 8 inches (200 mm) on center. Seal outside edge with termination mastic.
   1. Mechanically fasten sheet metal head flashing to substantial substrate such as backing strip, studs, header, or masonry.

3.04 FIELD QUALITY CONTROL

A. Just prior to covering, inspect flashings to ensure that flashing forms a continuous, uninterrupted path shedding water to the exterior while preventing water from entering the interior of the building in full compliance with this specification and the manufacturer's installation instructions. Ensure that flashing is undamaged by exposure, weather, or other inadvertent damage.

B. Obtain the Architect’s approval of initial installation before proceeding with full-scale production.

3.05 CLEANING AND PROTECTION

A. Protect adjacent surfaces from contamination by surface conditioners, primers, or adhesive residue.

B. Remove spills, stains, or over-application in accordance with manufacturer’s recommendations.

C. Protect installed material from damage. Repair any damage to sheet promptly.

D. If schedule of construction would unavoidably expose sheet materials to sunlight for more than 30 days, cover materials to avoid exposure to sunlight, unless approved in writing by the Architect and the Manufacturers Representative.

END OF SECTION

SECTION 07 71 23 - GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gutters.

B. Downspouts.

C. Precast concrete splash pads.

1.02 REFERENCES

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. Product Data:
   1. Provide data on finishes.

B. Samples: Submit three samples, 6 inch (150 mm) long illustrating finish.

C. Shop Drawings: Indicate configurations, jointing methods, fastening methods, and installation details. Provide a plan drawing indicating type and location of joints.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Sheet: ASTM B209.
   1. Thickness: 0.060 inch (1.52 mm).
   2. Finish: Coil-coated, baked-on, PVDF (polyvinylidene fluoride) coating.
   3. Color: Custom color to match color selected for metal wall panels in Section 07 42 14.

B. Fasteners:
   1. Stainless steel or aluminum, match finish.

2.02 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3,000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.

2.03 FABRICATION

A. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.

B. Gutters:
   1. SMACNA (ASMM) Rectangular style as indicated on the drawings.
   2. Depth: 8 inches (203 mm). Width: 8 inches (203 mm).
   3. Roll-Form gutters in continuous lengths without transverse seams except at expansion joints and corners unless otherwise required or permitted.
   4. Fabricate expansion joints as shown in SMACNA (ASMM) Figure 1-6 or 1-7.
   5. Provide gutter brackets as shown in SMACNA (ASMM) Figure 1-12.
      a. 1/4 x 2 inch (6 x 50 mm).
   6. Provide gutter spacers as shown in SMACNA (ASMM) Figure 1-12

7. Rivet seams, end caps, corners, and downspout outlets to form strong, permanent construction.
8. Seal seams watertight.

C. Downspouts:
1. SMACNA (ASMM) Fig. 1-31, rectangular profile.
2. Shop-fabricated hangers, SMACNA (ASMM) profile as indicated on the drawings.
3. Size: 4 inch by 4 inch minimum.
4. Form bends and offsets as required by project conditions.
5. Crimp and form slip-joints in downspouts, and secure with mechanical fasteners.

2.04 FACTORY FINISHING

A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with SMACNA (ASMM) instructions.

B. Box and Ogee Gutters:
1. Do not fix gutter to building with fasteners other than within 2 feet (610 mm) of the center of the gutter length.
2. Support gutters on brackets spaced at not more than 36 inches (915 mm) o.c. Install spacers at not more than 36 inches (915 mm) o.c. Stagger brackets and spacers 18 inches (460 mm).
3. Fasten front lip of gutter to gutter brackets through slotted holes, similar to SMACNA (ASMM) Fig. F 1-16B.

C. Set splash pad under each downspout not connected to downspout boots. Install roofing walkway pad specified in Section 07 50 00 under splash pad.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof hatches.

1.02 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

B. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. Manufacturer Warranty: Provide 2-year manufacturer warranty for roof hatch. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries; Thermalblock Series: www.activarcpg.com.
   2. Bilco Company; Type TB (various types and special size): www.bilco.com.
   3. Nystrom, Inc; ThermalMAX: www.nystrom.com.

B. Roof Hatches and Smoke Vents: Factory-assembled stainless steel frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.
   2. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.
   3. Thermally Broken Hatches: Provide insulation within frame and cover.
   4. For Ships Ladder Access: Single leaf; 30 by 54 inches (762 by 1372 mm).

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Stainless steel, Type 304, 14 gauge, 0.0747 inch (1.90 mm) thick.
   2. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid polyisocyanurate, located on outside face of curb.
   3. Curb Height: 12 inches (305 mm) from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf (1.92 kPa) live load.
   2. Material: Type 304 stainless steel; outer cover 14 gauge, 0.0747 inch (1.90 mm) thick, liner 22 gauge, 0.03 inch (0.76 mm) thick.

3. Insulation: Manufacturer's standard 1 inch (25 mm) rigid polyisocyanurate.
4. Gasket: Neoprene, continuous around cover perimeter.

E. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
1. Railing Size: 30 by 54 inches (762 by 1,372 mm).
2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
4. Posts and Rails: Fiberglass reinforced polymer tubing.
5. Gate: Same material as railing; automatic closing with latch.
6. Finish: Manufacturer's standard; molded in integral safety yellow.

F. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

END OF SECTION

SECTION 07 72 10 - ROOF PENETRATION ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flashings for penetrations in roofing membrane.

1.02 REFERENCES

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B32 - Standard Specification for Solder Metal; 2020.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2003.

1.03 SUBMITTALS

A. Product Data:
   1. Provide manufacturer's specifications, standard details, and installation recommendations.
   2. Indicate size and spacing of fasteners.

PART 2 PRODUCTS

2.01 MATERIALS

A. Flashings, Counterflashings, and Receivers: Stainless Steel Sheet: ASTM A666, Type 302 or 304. 26 gauge, 0.019 inch (0.47 mm).

B. Fasteners:
   1. For attachment of roof accessories to supporting structure: Hot-dip galvanized, zinc plated or cadmium plated steel, or stainless steel.
   2. Concealed fasteners for flashings and receivers: Hot-dip galvanized steel or stainless steel.
   3. Exposed fasteners: Stainless steel.

C. Hot-Dip Galvanizing for fabricated products and hardware: ASTM A123/A123M.

D. Solder: ASTM B32, 50/50 tin-lead, rosin flux unless recommended otherwise by sheet metal manufacturer.

E. Bituminous Coating: Asphaltic mastic ASTM D4479/D4479M, Type I.

F. Insulation: Mineral (Rock or Slag) Fiber Insulation Board; ASTM C612; composed of thermosetting resin binders and semirefractory mineral fibers derived from slag.

2.02 COLUMNS, POSTS, AND SIMILAR PENETRATIONS

A. Provide roofing membrane manufacturer's standard prefabricated thermoplastic or elastomeric boot or liquid flashing or provide sheet metal penetration flashings as specified herein, as required by project conditions encountered.

B. Flashing:
   1. Round columns supported on concrete deck: SMACNA (ASMM) Figure 4-17A, or "PD/PS" series by S.B.C. Industries.
   2. Columns other than round columns on concrete deck: "AD/AS, SQ/T, ID/IS, or HD/HS" series by S.B.C. Industries.

3. Round columns supported independently of deck: SMACNA (ASMM) Figure 4-17B, or "PD/PS" series by S.B.C. Industries.
4. Light equipment on legs: SMACNA (ASMM) Figure 4-17D, or "PD/PS, AD/AS, SQ/T, ID/IS, or HD/HS" series by S.B.C. Industries.
5. Where structural base is indicated: SMACNA (ASMM) Figure 4-17C.

C. Flashing: SMACNA (ASMM) Figure 4-17A, or "PD/PS" series by S.B.C. Industries; www.sbcflashings.com. (800-228-2580; 305-893-2036)

D. Flashing Material: Stainless steel.

E. Install wood nailer and around flashing to fully support flashing flange.
1. Mechanically fasten membrane to nailer in accordance with membrane manufacturer’s recommendations.
2. Mechanically fasten flashing flange to nailer.
3. Nailer thickness equal to insulation thickness.

2.03 VERTICAL PIPING PENETRATIONS NOT SUBJECT TO MOVEMENT

A. Provide roofing membrane manufacturer's standard prefabricated thermoplastic or elastomeric boot or liquid flashing or provide sheet metal penetration flashings as specified herein, as required by project conditions encountered.

B. Typical Applications:
1. Conduit.
2. Large diameter piping rigidly anchored to concrete roof deck.

C. Flashing: SMACNA (ASMM) Figure 4-17A, or "PD/PS" series by S.B.C. Industries; www.sbcflashings.com. (800-228-2580; 305-893-2036)

D. Flashing Material: Stainless steel.

E. Install wood nailer and around flashing to fully support flashing flange.
1. Mechanically fasten membrane to nailer in accordance with membrane manufacturer’s recommendations.
2. Mechanically fasten flashing flange to nailer.
3. Nailer thickness equal to insulation thickness.

2.04 VERTICAL PIPING PENETRATIONS SUBJECT TO MOVEMENT (VIBRATION, THERMAL EXPANSION/CONTRACTION)

A. Typical penetrations:
1. Hot and cold water piping.
2. Chilled water piping.
3. Steam piping.
4. Similar penetrations.

B. Provide roof curb.

C. Counterflashing:
1. Single, round penetrations up to 12 inches (305 mm) diameter: SMACNA (ASMM) Figure 4-14A.
2. Multiple, round penetrations up to 12 inches (305 mm) diameter each: SMACNA (ASMM) Figure 4-14B.
3. Maintain not less than 2 inches (51 mm) clear between penetrations.

D. Provide clearance between curb, penetration, and counterflashing to accommodate expected range of movement.

E. Fill void inside of curb with mineral wool insulation to depth of slab plus roofing insulation.

F. Flashing material: Stainless steel.

2.05 OTHER PENETRATIONS AND CONDITIONS

A. At conditions not scheduled or otherwise indicated, provide roofing membrane manufacturer's standard prefabricated thermoplastic or elastomeric boot or liquid flashing or provide curbs and

flashings in accordance with SMACNA (ASMM) standard details and recommendations, and fabricated of the materials specified herein.

2.06 SCHEDULE OF VERTICAL CLEARANCES

A. Fabricate equipment supports and pipe supports to provide not less than the following distances. W=width of equipment. H=height measured from roof membrane surface to underside of equipment.
   1. W less than 25 inches (635 mm): H= 14 inches (356 mm).
   2. W 25 inches (635 mm) to less than 37 inches (940 mm): H= 18 inches (457 mm).
   3. W 37 inches (940 mm) to less than 49 inches (1245 mm): H= 24 inches (610 mm).
   4. W 49 inches (1245 mm) or greater: H= 48 inches (1219 mm).

2.07 FLASHING FABRICATION

A. Shop fabricate flashings, counterflashings, receivers, sleeves, bonnets, and other sheet metal items to the greatest extent practicable.

B. Soldering:
   1. Soldered joints are required for all joints except between two-piece receiver and counterflashing. Sealant joints are not acceptable substitutes for soldered joints. Sealant shall be installed between sheet metal fabrications and adjacent construction, not as a means of fabricating sheet metal.
   2. Clean surfaces to be soldered, removing oils and foreign matter.
   3. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in the finished work.
   4. Do not use torches for soldering.
   5. Heat surfaces to receive solder and flow solder into joint. Fill joint completely.
   6. Completely remove flux and spatter from exposed surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates and openings are rigidly set, at proper lines and elevation, properly sized, and ready to receive units.

B. Do not proceed with installation until conditions detrimental to proper installation have been corrected.

C. Coordinate installation with roofing work and other adjacent elements of building envelope to ensure watertight construction.

3.02 DISTANCE BETWEEN PENETRATIONS

A. Coordinate and layout mechanical, electrical, and structural work to provide clearance between penetrations as follows:
   1. Distance between curb and adjacent curb: Not less than 20 inches (508 mm).
   2. Distance between curb and adjacent wall or equipment extending more than 36 inches (915 mm) above roof: Not less than 36 inches (915 mm).
   3. Distance between stripped-in roof jacks and adjacent curbs, parapets, or walls: Not less than 18 inches (457 mm).
   4. Distance between stripped-in jacks: Not less than 12 inches (305 mm).

B. If the Contract Documents appear to indicate clearances less than above, obtain instructions from the Architect before proceeding with layout and coordination. Do not construct clearances less than above without the approval of the Architect. If clearances less than above have been constructed without the express approval of the Architect, reconstruct clearances without change in Contract Time or Price.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Install products in correct location, plumb and true, without warp or twist.

C. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coating, adhered polyethylene sheet, or other means approved by the Architect.

3.04 SEALING OF ENVELOPE

A. General: Install sealant to form a water-tight and air-tight seal between penetrating elements and building envelope.

B. Where roof deck is indicated to be a fire-resistance-rated assembly, install firestopping between penetrating elements and deck. Firestopping is specified elsewhere in Division 07.

C. Where roof deck is not indicated to be a fire resistance rated assembly:
   1. Fill void between penetration and deck with mineral wool insulation and install pourable sealant to seal between penetrating element and deck.
   2. Where curbs are not used, install pourable sealant up to top of sheet metal flashing.
   3. Exception: Where prohibited by flue or stack clearance requirements.

3.05 CLEANING AND PROTECTION

A. Touch up marred or abraded areas of finished elements. If satisfactory touch-up cannot be accomplished, remove and replace element.

3.06 SMACNA FIGURES

A. See the SMACNA (ASMM) for additional material, fabrication, and joining requirements.

END OF SECTION

SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of concealed interior structural steel.

B. Fireproofing of architecturally exposed interior steel.

C. Fireproofing of semi-exposed interior steel.

D. Fireproofing of exposed and concealed exterior structural steel.

E. Installation accessories.

1.02 REFERENCES

A. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

B. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2019).

C. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2019.

D. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2017.

E. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019.

F. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019.

G. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).

H. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).

I. ASTM E761/E761M - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

K. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Material (SFRMs) Applied to Structural Members; 1993 (Reapproved 2020).

L. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2020).

M. AWCI 117 - Technical Manual 12-B; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide; 2014.

N. AWCI 117 - Technical Manual 12-B; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide; 2014.

O. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 DEFINITIONS

A. Concealed Interior: Surfaces that are completely protected from weather during construction and thereafter, and are concealed from view.

B. Exposed Interior: Surfaces that are exposed to view and are within occupied spaces other than parking or service spaces.

C. Semi-Exposed Interior: Surfaces that are exposed to view within parking or services or similar spaces.

D. Exterior: Surfaces that are exposed to weather during construction, and surfaces that are exposed to weather thereafter.

1.04 SUBMITTALS

A. Product Data:
   1. Provide data indicating product characteristics, performance criteria, and limitations of use.
   2. Evidence of Acceptable Testing: Submit for each fire-resistance rated assembly to be constructed. Listing of the assembly to be used in the current edition of the UL (FRD) "Fire Resistance Directory" will be considered evidence of acceptable testing. In lieu of such a directory listing, official printed notification from Underwriters Laboratories Inc., stating that the assembly in question has been tested and approved, will also be considered evidence of acceptable testing.
   3. Submit manufacturer's UL Design data.

B. Where fireproofing is to be applied to primed or painted steel, submit either:
   1. UL test report on primer indicated specific primer and maximum uninterrupted span of structural steel surface.
   2. Bond test results.

C. Shop Drawings:
   1. Submit a schedule identifying each size of deck or beam or column or other structural element, each assembly, and the corresponding thickness of the spray-applied fireproofing material along with remarks indicating any other elements required by the UL Design such as bonding agents, lath, etc.
   2. Submit framing plans showing elements to be fireproofed and the thickness of spray-applied fireproofing to be applied to each element.
   3. Where size of structural element used on the project is smaller than the size indicated in the UL Design, identify same and include calculation of required thickness of spray-applied fireproofing material to be applied to such element in compliance with UL requirements.

D. Test reports: Submit results of field quality control tests indicated in Part 3 of this section.

1.05 MOCK-UP

A. Before beginning fireproofing work, construct mock-up at location as directed by the Architect. Accepted mock-up shall be preserved throughout construction period and shall establish qualities of materials, workmanship, and appearance to be expected in the completed installation. Construct one mock-up for each of the following:
   1. Fireproofing exposed to view.
      a. Cementitious fireproofing.
      b. Exterior intumescent fireproofing.

B. Approximate dimensions for each mock-up:
   1. Cementitious: Surface area of [100] sq.ft ([9.30] sq.m), full indicated thickness.
   2. Intumescent: Exposed length of one member, full indicated thickness.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in dry, protected area in manufacturer's original shipping containers bearing labels which include UL fire resistance ratings, manufacturer's name, product name, date of manufacture, and shelf life instructions where required.

B. Do not use products beyond manufacturer's indicated shelf life.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Ambient and substrate temperatures and relative humidity immediately preceding, during, and for 24 hours after fireproofing installation: Comply with manufacturer's recommendations.

2. Provide adequate air ventilation to ensure proper curing of fireproofing materials.

B. Sequence work in conjunction with placement of ceiling hanger tabs, mechanical component hangers, electrical components, partitions, and other components and materials.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with other work as required to ensure that installed materials are not damaged during construction period and that fire resistance ratings are not compromised by work of other trades.

B. Schedule fireproofing installation sufficiently in advance of other work to permit field quality control testing and any required corrective procedures to be completed before construction which might interfere with these operations is started.

C. Do not begin to install fireproofing on underside of metal roof decking until roofing installation is finished; do not allow traffic on roof during fireproofing installation and drying period.

PART 2 PRODUCTS

2.01 FIREPROOFING

A. For all of each distinct fireproofing product indicated, provide materials produced by one manufacturer, factory-mixed, suitable for sprayed application, and requiring addition at the site of no other materials other than water.

2.02 CEMENTITIOUS FIREPROOFING

A. Manufacturers:
1. Carboline Company.
2. GCP Applied Technologies.
3. Isolatek International.

B. Low Density Cementitious Type: Factory mixed, cementitious material blended for uniform texture, and conforming to the following requirements:
1. Insulating material: Vermiculite or lightweight synthetic aggregate; mineral fiber not acceptable.
2. Bond Impact: ASTM E760/E760M, no cracking, flaking or delamination.
3. Noncorrosive: ASTM E937/E937M.
4. Deflection: ASTM E759/E759M, no cracking, spalling, or delamination.
5. Air Erosion: ASTM E859/E859M, 0.0005 g maximum weight loss per sq.ft (per sq.m).
6. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0, when tested in accordance with ASTM E84.
7. Products:
a. Carboline Company; Southwest Fireproofing Type 5 GP.
1) Bond Strength: ASTM E736/E736M, 200 psf (9.6 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum average density of 15 pcf (240.3 kg/cu m), with minimum individual density of any test sample of 14 pcf (224.3 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 3700 psf (177 kPa).
b. GCP; Monokote MK6HY.
1) Bond Strength: ASTM E736/E736M, 200 psf (10 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum average density of 15 pcf (240.3 kg/cu m), with minimum individual density of any test sample of 14 pcf (224.3 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 1,483 psf (71 kPa).
c. Isolatek International; Cafco 300 (300AC).
1) Bond Strength: ASTM E736/E736M, 406 psf (20 kPa) (412 psf (20 kPa)) when set and dry.

2) Dry Density: ASTM E605/E605M, minimum average density of 15 pcf (240.3 kg/cu m), with minimum individual density of any test sample of 14 pcf (224.3 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 3,311 psf (159 kPa) (3,167 psf (152 kPa)).

C. Medium Density Cementitious Type: Factory mixed, Portland cement blended for uniform texture with mineral aggregates or mineral fibers and additives, without chlorides, and conforming to the following requirements:
1. Bond Impact: ASTM E760/E760M, no cracking, flaking or delamination.
2. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0, when tested in accordance with ASTM E84.
3. Products:
a. Carboline Company; Pyrocrete 40.
1) Bond Strength: ASTM E736/E736M, 1,317 psf (63.05 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 40 lb/cu ft (640.74 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 594 psi (4095.49 kPa).
b. GCP; Monokote Z106HY.
1) Bond Strength: ASTM E736/E736M, 1,000 psf (47.88 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 22 lb/cu ft (352.40 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 80 psi (551.58 kPa).
c. Isolatek International; Cafco 400.
1) Bond Strength: ASTM E736/E736M, 2850 psf (136.45 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 25 lb/cu ft (400.46 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 88.4 psi (609.49 kPa).

D. High Density Cementitious Type: Factory mixed, Portland cement blended for uniform texture with mineral aggregates and additives, without chlorides, and conforming to the following requirements:
1. Approved by the manufacturer for exterior exposure.
2. Bond Impact: ASTM E760/E760M, no cracking, flaking or delamination.
3. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0, when tested in accordance with ASTM E84.
4. Products:
a. Carboline Company; Pyrocrete 241.
1) Bond Strength: ASTM E736/E736M, 14,085 psf (674.39 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 50 lb/cu ft (800.92 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 850 psi (5860.54 kPa).
b. GCP; Monokote Z146T.
1) Bond Strength: ASTM E736/E736M, 10,000 psf (478.80 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 40 lb/cu ft (640.74 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 550 psi (3792.12 kPa).
c. Isolatek International; Fendolite MII.
1) Bond Strength: ASTM E736/E736M, 11,870 psf (568.33 kPa) when set and dry.
2) Dry Density: ASTM E605/E605M, minimum density of 45 lb/cu ft (720.83 kg/cu m).
3) Compressive Strength: ASTM E761/E761M, minimum 548 psi (3778.33 kPa).
d. Finish:
1) Rolled spray-texture.

2.03 INTUMESCENT FIREPROOFING

A. Intumescent Fireproofing Concealed from View: Provide each of the following:
   1. Primer: Provide primer product in accordance with intumescent coating manufacturer's written recommendations. Other primers are not acceptable.
   2. Intumescent coating.

B. Intumescent Fireproofing Exposed to View: Provide each of the following:
   1. Primer: Provide primer product in accordance with intumescent coating manufacturer's written recommendations. Other primers are not acceptable.
   2. Intumescent coating.
   3. Top coating: Provide top coat product in accordance with intumescent coating manufacturer's written recommendations.
   4. Finish coating: Specified in Division 09.

C. Carboline Company; www.carboline.com.
   1. Primer: Provide primer product in accordance with intumescent coating manufacturer's written recommendations. Other primers are not acceptable.
   2. Intumescent Coating:
      a. A/D Firefilm III.
   3. Top Coating for Interior Surfaces Exposed to View:
      a. Semigloss Acrylic Top Coat: Carbocrylic 3350.
   4. Top coating for Exterior Surfaces Exposed to View (including surfaces concealed by cladding):
      a. As recommended by manufacturer.
   5. Finish Coating: Specified in Division 09. (Apply top coating specified above, then apply finish coating specified in Division 09.)

D. Intumescent Coating - Isolatek International; www.isolatek.com.
   1. CAFCO SprayFilm WB 4.
   2. Top coating for exterior exposure: CAFCO SprayFilm Topseal.

E. Intumescent Coating - PPG; ppgpmc.com.
   1. Steelguard 550 intumescent coating.
   2. Topcoat for exterior exposure: Steelguard 2458 finish coat.

F. Intumescent Type: Conforming to the following requirements:
   1. Bond Strength: ASTM D4541, 225 psi (1551 kPa) when set and dry.
   2. Impact Resistance: ASTM D2794, 80 inch-lb (9 Nm).
   3. Abrasion Resistance: ASTM D4060, 0.2071 g/1000 cycles.
   4. Hardness: ASTM D2240, 7.3 Shore D durometer.
   5. Surface Burning Characteristics: Maximum flame spread of 20 and smoke developed of 55 when tested in accordance with ASTM E84.

2.04 ACCESSORIES FOR CEMENTITIOUS FIREPROOFING

A. Provide necessary accessory materials as required by project conditions and UL Designs.

B. Primer and Bonding Agent: Where substrate and primer, if any, are not identical to those tested by UL, provide primer or other materials of type recommended by fireproofing manufacturer an in compliance with UL.

C. Reinforcing: Expanded metal lath, weight and finish in compliance with UL; reinforcing fabric or mesh in compliance with UL.

D. Water: Clean, potable.

2.05 COLOR

A. Where fireproofing is exposed to view, provide color as indicated, or if not indicated, as acceptable to the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are in satisfactory condition and ready to receive fireproofing. Substrates shall be clean, dry, and free from dirt, oil, and other contaminants. Primed substrates shall be approved, or tested and approved, as specified herein.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place and properly fastened.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

E. Notify the Architect in writing of any substrate conditions requiring correction by other than normal cleaning methods, prior to installation of fireproofing.

F. Do not apply fireproofing until roofing material is in place and substrates will not be subjected to wetting.

G. Do not apply fireproofing to metal deck that is yet to receive concrete topping.

H. Do not begin work until unsatisfactory conditions have been corrected; commencement of fireproofing installation indicates acceptance of conditions.

3.02 PREPARATION

A. Apply fireproofing to bare (unprimed) steel that is clean, dry, oil-free, and prepared in accordance with manufacturer's instructions.

B. Primed Steel or Oiled Metal Deck: See testing and preparation specified under Field Quality Control, below.

C. Preparation for Exposed Fireproofing: Repair surface irregularities that would affect thickness or appearance of finished fireproofing.

D. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

G. Take necessary precautions to protect workmen, the public, and the environment during installation.

3.03 APPLICATION

A. Install in strict accordance with UL (FRD) Underwriters Laboratories "Fire Resistance Directory" and material manufacturer's instructions.

B. Install fireproofing in a manner which will maximize adhesion between fireproofing and substrate and continuity of fire-resistive protection; use a single course of fireproofing unless otherwise recommended by fireproofing manufacturer.

C. Apply fireproofing in sufficient thickness to achieve required ratings, with as many passes as necessary to cover with monolithic blanket of uniform density and texture.

D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer and to match the approved mock-up.

3.04 FIELD QUALITY CONTROL

A. Inspect the installed fireproofing after application and curing for integrity, prior to its concealment. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings.

B. Re-inspect the installed fireproofing for integrity of fire protection, after installation of subsequent work.

C. Coordinate installation to permit testing and inspection agency to verify that fireproofing within each test area complies with indicated requirements, before fireproofing is installed in next test area.

D. The Owner will engage and pay an independent testing agency to conduct field inspection and testing of intumescent fireproofing to determine in accordance with AWCI 117 / AWCI 117 and the Building Code.

E. The Owner will engage and pay an independent testing agency to conduct field inspection and testing of cementitious SFRM to determine whether actual thicknesses, densities, and bond strengths meet specifications and fire rating requirements.

F. Conduct special inspections and tests of SFRM in accordance with Chapter 17 of the Building Code.
   1. Observe and test in accordance with the Building Code for condition of substrates (prior to application) thickness, density, bond strength, condition of finished application, and other attributes as required by the Building Code.
   2. Pass/fail of bond strength criterion shall be the greater of:
      a. The values required by the Building Code.
      b. Ninety % of the value listed in Part 2 of this specification.
   3. Pass/fail criteria of other attributes shall be the values required by the Building Code.
   4. Report results.

G. Testing agency shall submit written report to the Contractor and the Architect indicating results of field quality control tests.

H. Patch test areas to restore integrity of fireproofing.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed while materials is still wet and before it has begun to set.

3.06 PROTECTION

A. Follow instructions of fireproofing manufacturer to prevent damage to fireproofing.

B. Patch damaged fireproofing.

3.07 SCHEDULES

A. All assemblies are considered to be unrestrained, unless a restrained condition is specifically noted in the structural Contract Documents. Apply not less than the thickness required by the UL Design for unrestrained condition.
   1. Exception: Where a restrained condition is noted in the structural Contract Documents and the UL Design for fireproofing of beams and joists indicates "loading determined by ALD, LRFD or LSD methods", then the thickness required by the UL Design for restrained condition may be applied.
   2. Exception: Where a restrained condition is noted in the structural Contract Documents and a 1-hour fire-resistive rating is required, then the thickness required by the UL Design for restrained condition may be applied.
   3. Exception: Where a restrained condition is noted in the structural Contract Documents for metal roof deck and the UL Design requires a load restriction factor, beam and joist UL Designs that are not load restricted may be substituted into the UL Design.

B. Material Types and Densities:
   1. Apply Low Density Cementitious SFRM to the following locations:
      a. Concealed interior.
   2. Apply Medium Density Cementitious SFRM to the following locations:
      a. Semi-Exposed Interior.

3. Apply High Density Cementitious SFRM to the following locations:
   a. Exposed Interior.
   b. Concealed exterior.
4. Apply Intumescent Fireproofing to the following locations:
   a. Exposed exterior.

C. Install fireproofing on all portions of the elements listed below, including lateral bracing of such elements.

3.08 CEMENTITIOUS SFRM - BUILDING CONSTRUCTION TYPE 2A

A. COMPONENT HOURLY RATING DESIGN (Carboline)

1. Columns:

a.	Wide Flange	1 hr.	Y725
b.	Tube/Pipe (std/med density)	1 hr.	X771
c.	Tube/Pipe	1 hr.	X771

2. Metal Roof Deck with Foam Plastic or Mineral Fiber Roofing Insulation:

a.	Roof deck	1 hr.	P741
b.	Roof joists	1 hr.	P741
c.	Roof beams	1 hr.	P741

3. Composite Floor Deck with adequate concrete cover:

a.	Floor deck	1 hr.	D949
b.	Floor beams	1 hr.	D949
c.	Floor joists	1 hr.	D949

4. Floor Deck with SFRM:

a.	Floor deck	1 hr.	D788
b.	Primary floor beams	1 hr.	D788
c.	Floor joists	1 hr.	D788

B. COMPONENT HOURLY RATING DESIGN (GCP)

1. Columns:

a.	Wide Flange	1 hr.	X854
b.	Tube/Pipe (std/med density)	1 hr.	Y710
c.	Tube/Pipe	1 hr.	X854

2. Metal Roof Deck with Foam Plastic or Mineral Fiber Roofing Insulation:

a.	Roof deck	1 hr.	P753
b.	Roof joists	1 hr.	S749
c.	Roof beams	1 hr.	S750

3. Composite Floor Deck with adequate concrete cover:

a.	Floor deck	1 hr.	D985
b.	Floor beams	1 hr.	N852
c.	Floor joists	1 hr.	N854

4. Floor Deck with SFRM:

a.	Floor deck	1 hr.	D798
b.	Primary floor beams	1 hr.	N852
c.	Floor joists	1 hr.	N854

C. COMPONENT HOURLY RATING DESIGN (Isolatek)

1. Columns:

a.	Wide Flange (std/med density)	1 hr.	X790
b.	Wide Flange (high density)	1 hr.	X764
c.	Tube/Pipe (std/med density)	1 hr.	X790
d.	Tube/Pipe (high density)	1 hr.	X768

2. Metal Roof Deck with Foam Plastic or Mineral Fiber Roofing Insulation:

a.	Roof deck (std/med density)	1 hr.	P719 / P723
b.	Roof joists	1 hr.	S751
c.	Roof beams	1 hr.	S751

3. Composite Floor Deck with adequate concrete cover:

a.	Floor deck	1 hr.	D988
b.	Floor beams	1 hr.	N743
c.	Floor joists	1 hr.	N792

4. Floor Deck with SFRM:

a.	Floor deck	1 hr.	D799
b.	Primary floor beams	1 hr.	N743
c.	Floor joists	1 hr.	N792

3.09 INTUMESCENT FIREPROOFING

A. COMPONENT HOURLY RATING DESIGN

1. Columns:
   Exception for Construction Type 2A: The rating of columns supporting a roof, only, may be reduced by 1 hour.

a.	Wide Flange	1 hr.
b.	Tube/Pipe	1 hr.

2. Metal Roof Deck with Foam Plastic or Mineral Fiber Roofing Insulation:

a.	Roof deck	1 hr.
b.	Roof joists	1 hr.
c.	Roof beams	1 hr.

3. Composite Floor Deck with adequate concrete cover:

a.	Floor deck	1 hr.
b.	Floor beams	1 hr.
c.	Floor joists	1 hr.

4. Floor Deck with SFRM:

a.	Floor deck	1 hr.
b.	Primary floor beams	1 hr.
c.	Floor joists	1 hr.

END OF SECTION

SECTION 07 84 00 - FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protection of fire-resistance-rated construction as required by the building code, and using materials subject to the limitations of this specification.

B. The location and extent of fire-resistance-rated construction is indicated on the Drawings.
   1. Protect every penetration into or through such construction.
   2. Protect every joint in such construction or between elements of such construction and adjacent construction.

C. Work Not Included: Repairing penetrations made in error and repairing penetrations which are too large to be sealed by the methods indicated; these are to be repaired using the original material of the construction.

1.02 REFERENCES

A. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

B. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2020.

D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

E. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

F. FM 4991 - Approval Standard of Firestop Contractors; 2013.

G. FM P7825 - Approval Guide; current edition.

H. ITS (DIR) - Directory of Listed Products; current edition.

I. UL (FRD) - Fire Resistance Directory; Current Edition.

J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.03 DEFINITIONS

A. Fire Wall, Fire Barrier, Smoke Barrier, Fire Partition: As defined by the building code.

1.04 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance ratings, limitations, and tested assembly details including preparation and installation instructions.

B. Installer Qualifications.

C. Shop Drawings - Schedule: Submit a single, integrated, and complete list of joints and penetrations to be sealed including penetrations caused by mechanical, electrical, plumbing, and other work. Do not submit separate schedules prepared by the various subcontractors. Identify the following:
   1. Type of penetration (floor, wall, other).
   2. Fire rating of penetrated assembly.
   3. Material of penetrated assembly (e.g., cast-in-place concrete wall, CMU wall, composite floor deck, etc.).
   4. Size and material of the penetrating object (e.g. 4 to 8 inches (100 to 200 mm) C.I.P, EMT up to 2 inch (50 mm) dia., etc.).
   5. Testing laboratory design number.

6. Manufacturer’s design number.

D. Preinstallation Inspection Report.

E. Final Inspection Report.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this Section and:
   1. Either approved by Factory Mutual Research under FM 4991, Approval of Firestop Contractors or listed as a UL Qualified Firestop Contractor in accordance with the UL Qualified Firestop Contractors Program (QFCP).
   2. Licensed to perform firestopping work in the jurisdiction in which the Project is located.

B. Manufacturer's technical representative shall be available for initial job start-up and trouble-shooting as needed, and to assist with inspections.

C. Coordination Meeting: Prior to the start of work which involves cutting penetrations, conduct a meeting with installers of such work to identify fire barriers and required configurations of penetrations and to discuss the proper procedures and time schedule for cutting, patching, and sealing penetrations in such assemblies, with emphasis on avoiding unnecessary cutting and patching.

1.06 REGULATORY REQUIREMENTS

A. Protect fire rated construction as required by the building code, and using materials subject to the limitations of this specification. Construction to be protected includes:
   1. Penetrations into or through fire walls, fire barriers, and fire partitions.
   2. Penetrations into or through fire-resistance-rated floors, floor/ceiling assemblies, and the ceiling membrane of roof/ceiling assemblies.
   3. Joints in or between fire-resistance-rated walls, floors, floor/ceiling assemblies, roofs, and roof/ceiling assemblies.
   4. Joints between fire-resistance-rated floor or floor/ceiling assemblies and exterior curtain wall assemblies (where a curtain wall is formed by wall materials that bypass the floor slab edge such as aluminum framing and glass, studs and other cladding, or other wall materials).

1.07 MOCK-UP

A. Install one mock-up of each major type of firestop assembly using proposed materials and illustrating workmanship to be expected in the completed work.

B. Include a penetration label and an adjacent partition label in the mock-up.

C. Obtain approval of the manufacturer's technical representative before proceeding with firestopping work.

D. Disassembly or removal may be required during inspection.

1.08 PROJECT CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation.

B. Provide ventilation in areas where solvent-cured materials are being installed.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original unopened containers bearing the name of the manufacturer, product name, type, and testing agency's identification mark.

B. Store products in accordance with manufacturer's instructions.

1.10 SEQUENCING AND SCHEDULING

A. Perform firestopping work after completion of work which penetrates fire barriers, but prior to covering up or eliminating access to the penetration. Coordinate with installers of such other work.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Provide sealants and sealant primers for interior applications complying with South Coast Air Quality Management District (SCAQMD) Rule No. 1168 as follows:
   1. Architectural Sealant VOC Limit: 250 g/l.
   2. Sealant Primers for Nonporous Substrates: Not more than 250 g/l.
   3. Sealant Primers for Porous Substrates: Not more than 775 g/l.

2.02 MANUFACTURERS

A. Fire Testing of Assemblies: Provide materials and designs that have been tested by approved agencies, as follows:
   1. Listing in the current-year classification or ITS (DIR), FM P7825, or UL (FRD) will be considered as constituting an acceptable test report.
   2. Engineering Judgments provided in lieu of test agency listing must be sealed and signed by a Professional Engineer licensed in the State of North Carolina.

B. Provide products complying with requirements of the contract documents and made by a single manufacturer to the greatest extent practicable, unless otherwise indicated and approved by the Architect.

2.03 MATERIALS

A. Firestopping Materials: Provide assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
   1. If a tested assembly is not available for a particular penetration or joint configuration, modify the penetration or joint configuration to suit available assemblies; do not modify assembly configuration except as specifically stated in the test report or as approved by the authority having jurisdiction.
   2. Provide products that:
      a. Allow normal expansion and contraction movement of the assembly without failure of the seal.
      b. Emit no hazardous, combustible, or irritating by-products during installation or curing period.
      c. Do not require special tools for installation.
   3. Provide products that allow for differential movement unless otherwise approved.
   4. For products used in horizontal assemblies, provide products that are impervious to water when fully cured.
   5. For materials used in expansion joints, provide sealant with at least 40% movement capability in compression or extension. For other joints provide at least 25% movement capability in compression or extension.
   6. Select assemblies and products so as to minimize the number of different assemblies and different products used.

B. Penetration Assembly Labels: Permanent, red marking with black lettering.
   1. For marking firestopping assemblies, use wired-on labels unless otherwise approved.
   2. Legend:
      a. "Fire-Rated Assembly - Do not disturb - See maintenance instructions".
      b. Product manufacturer’s name.
      c. U.L. Des. No. _____
      d. F rating: _____
      e. T rating: _____
      f. Installer’s name.

C. Partition Labels:
   1. Permanent, red lettering with legend "RATED FIRE BARRIER - PROTECT ALL OPENINGS".

2. Use letters at least 2 inches (50 mm) high with 1/4 inch stroke.

2.04 ASSEMBLIES

A. Protect fire rated construction as required by the building code, and using materials subject to the limitations of this specification.
   1. Exceptions: Certain materials, locations, and assemblies are exempt where permitted by the building code and approved by the authorities having jurisdiction.

B. Penetrations into or through fire walls, fire barriers, and fire partitions: Provide through-penetration firestop systems tested per ASTM E814 or UL 1479, minimum positive pressure differential of 0.01 inch (0.25 mm) of water, F rating not less than that of the wall.

C. Penetrations into or through fire-resistance-rated floors, floor/ceiling assemblies, and the ceiling membrane of roof/ceiling assemblies: Provide through-penetration firestop systems tested per ASTM E814 or UL 1479, minimum positive pressure differential of 0.01 inch (0.25 mm) of water, F rating and T rating not less than that of the floor nor less than 1 hour whichever is greater.

D. Joints in or between fire-resistance-rated walls, floors, floor/ceiling assemblies, roofs, and roof/ceiling assemblies: Provide fire-resistant joint systems tested per ASTM E1966 or UL 2079.

E. Joints between fire-resistance-rated floor or floor/ceiling assemblies and exterior curtain wall assemblies (where a curtain wall is formed by wall materials that bypass the floor slab edge such as aluminum framing and glass, studs and other cladding, or of other wall materials): Provide an approved system tested per ASTM E2307, F rating not less than that of the floor.

F. Joints at the intersection of horizontal smoke barriers and exterior curtain wall assemblies: Provide fire-resistant joint systems tested per UL 2079 for air leakage. The L rating measured at 0.30 inch (7.6 mm) of water in ambient and elevated temperature tests: Not greater than 5 cfm/lf (28 cu m/hr/lm).

2.05 ACCESSORIES

A. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Preinstallation Inspection:
   1. Inspect for penetrations of any type; mark or otherwise identify all penetrations indicating action required: "Repair" or "Firestop".
   2. Conduct inspection prior to covering up or enclosing walls or ceilings.
   3. Conduct inspection jointly with authorized representative of authority having jurisdiction, unless the authority waives the inspection.
   4. Submit a report detailing findings of inspection to the Architect.

B. If the configuration of a particular penetration does not conform to the configuration necessary for the required firestopping assembly, modify the construction to suit the firestopping assembly design.

3.02 PREPARATION

A. Prepare penetrations in accordance with material manufacturer's instructions.

B. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

C. Remove incompatible materials which may affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings. Provide all accessory materials required.

B. Produce a smooth, uniform, neat appearing finish.

C. Remove combustible forming materials, unless they are a required component of the tested assembly.

D. Do not cover installed firestopping until inspected by authority having jurisdiction, unless such inspection is waived by the authority.

3.04 PERMANENT IDENTIFICATION

A. Affix penetration assembly labels to each fire-stop penetration assembly with mechanical fasteners. Adhesive labels without fasteners are not acceptable.

B. Within accessible concealed ceilings spaces and within accessible concealed floor, floor-ceiling, or attic spaces, install partition identification labels on fire walls, fire barriers, fire partitions, and smoke partitions. Install labels in the concealed space within 15 feet (4.5 m) of ends of such walls and at intervals not exceeding 30 feet (9 m).

3.05 FIELD QUALITY CONTROL

A. Special inspections are required by the building code or by the authority having jurisdiction. Inspections shall be conducted in accordance with ASTM E2174 and ASTM E2393 by an approved inspection agency acceptable to the authority having jurisdiction.
   1. The Owner will pay for the cost of one such inspection. The cost of additional inspections, if required, will be deducted from the Contract Price in accordance with the General Conditions.

B. Special Inspections: Coordinate and schedule special inspections by the approved inspection agency.

C. Inspect completed installations for completeness and correct installation.
   1. Arrange for the firestopping material manufacturer's representative to conduct an inspection of completed work.
   2. If installed work is to be covered in completed work, inspect and obtain approval prior to covering.

D. Submit report of inspection to the Architect.

E. Notify the Architect of completed firestopping work prior to covering with subsequent work.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces of excess firestopping materials promptly. Use methods and materials approved by the manufacturers of the penetration seals and of surfaces to be cleaned.

B. Protect adjacent surfaces from damage by material installation.

C. Protect installed work during curing period.

D. Protect installed work from damage from construction operations using substantial barriers, if necessary.

E. Repair damaged firestopping and adjacent materials in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 84 53 - SPANDREL INSULATION ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermal insulation at spandrel.

1.02 REFERENCES

A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations for each product specified in this section.

1.04 COORDINATION

A. Spandrel insulation and installation method to match requirements of spandrel insulation provided for slab edge conditions per Section 07 84 00. Provide spandrel insulation at all spandrel glass locations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide manufacturer's standard preformed insulation units and accessory materials:
   1. Thermafiber, Inc; Thermafiber Fire/Smoke-Stop System: www.thermafiber.com.
   2. Insulation: Mineral (Rock or Slag) Fiber Insulation Board; ASTM C612; composed of thermosetting resin binders and semirefractory mineral fibers derived from slag.
   3. Size for proper fit in indicated applications.

B. Spandrel Insulation:
   1. Spanning between mullions or other supports:
      a. 3 inches (72 mm) thick unless otherwise indicated.
      b. Johns Manville; MinWol Curtainwall 80, foil faced; jm.com.
      c. Rockwool International A/S; Curtainrock 80, foil faced: rockwool.com.
      d. Product: Thermafiber, Inc.; Thermafiber CW 90 FireSpan, Foil-Faced: www.thermafiber.com.
   2. Covering mullions and other supports:
      a. 1 inch (25 mm) thick unless otherwise indicated.
      b. Johns Manville; MinWool Curtainwall 40; jm.com.
      c. Rockwool International A/S; Curtainrock 40, foil faced: rockwool.com.
      d. Product: Thermafiber, Inc.; Thermafiber CW 40 FireSpan, Foil-Faced: www.thermafiber.com.
   3. Completely filling cavities:
      a. Johns Manville; MinWool Curtainwall 40, foil faced; jm.com.
      b. Rockwool International A/S; Curtainrock 40, foil faced: rockwool.com.
      c. Product: Thermafiber, Inc.; Thermafiber CW 40 FireSpan, Foil-Faced: www.thermafiber.com.

2.02 ACCESSORIES

A. Provide accessories as necessary to properly install specified products.

B. Tape: Metal foil, self-adhering type, as recommended by insulation manufacturer.

C. Mechanical Fasteners and Supports: As recommended by insulation manufacturer and in accordance with tested assemblies:
   1. Brackets, clips, angles, shields, etc.: Galvanized steel sheet.
   2. Z-clips, impaling pins, and other fasteners for substrate and application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions conform to requirements of contract documents.

B. Verify that related work to be performed within indicated spaces before installation of insulation has been completed.

C. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

D. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation indicates acceptance of conditions.

3.02 PREPARATION

A. Clean substrates of any substances which might damage materials to be installed.

3.03 INSTALLATION

A. Do not install insulation which is damaged, wet, soiled, or which has been covered at any time with ice or snow.

B. Comply with insulation manufacturer's recommendations and installation sequence.
   1. Provide permanent mechanical support of insulation.
   2. Install in accordance with tested assemblies and to meet project conditions using galvanized steel sheet brackets, clips, angles, shields, etc., z-clips, impaling pins, and other fasteners.

C. Insulation:
   1. Cut insulation neatly as required to fit snugly around obstructions.
   2. Use insulation manufacturer's recommended mechanical fasteners to attach insulation.

D. Sealing:
   1. Install foil faced insulation and joint tape to provide a continuous barrier against the migration of water vapor from the interior toward the exterior of the building. Install foil face toward the interior of the building.

3.04 PROTECTION

A. Protect installed materials from damage until permanent concealing work is completed.

B. Where concealing work is not performed immediately after installation work of this section is completed, erect suitable temporary coverings or enclosures to prevent damage.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes:
   1. Sealants and joint backing.

B. Work of this section includes:
   1. Sealing of joints indicated in the schedule at the end of this section and in other locations required by the Contract Document.
   2. Seal joints in exterior envelope to prevent the entry or escape of water or air.
   3. Seal joints on the interior of the building to prevent the passage of water or air from space to space or between adjacent building materials and assemblies.
   4. Joints of a nature similar to that of joints indicated shall be sealed with same sealer, whether or not specifically indicated on the drawings and schedules to be sealed.

C. Section Does Not Include:
   1. Acoustical Sealant: Section 09 21 16 - Gypsum Board Assemblies.
   2. Firestopping: Section 07 84 00 - Firestopping.

1.02 REFERENCES

A. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

1.03 DEFINITIONS

A. M Type Substrates: Cast-in-place concrete, concrete masonry units, clay brick, masonry mortar, natural stone.

B. G Type Substrates: Glass and transparent plastic glazing sheets.

C. A Type Substrates: Metals, porcelain, glazed tile, and smooth plastics.

D. O Type Substrates: Wood, unglazed tile; substrates not included under other categories.

E. Use T: Surfaces bearing pedestrian or vehicular traffic.

F. Use NT: Non-traffic-bearing surfaces.

1.04 SUBMITTALS

A. Product Data:
   1. Provide manufacturer's data on each joint sealer indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability, and installation instructions.
   2. Provide manufacturer's technical guide containing recommendations for primers for each exterior sealant/substrate combination.

B. Project Sealant Schedule: Submit a coordinated schedule of all sealants to be used on the project. On each line, include sealant application/location, manufacturer and product name, color or colors proposed for use.

C. Samples: Submit two cured samples for each product exposed to view, illustrating full range of sealant colors available for selection.

D. Test Reports:
   1. Substrate test report for each joint sealer.
   2. Field installation test reports for each joint sealer.

E. Installer's Preconstruction Inspection Report: List all conditions detrimental to performance of joint sealer work.

F. Warranty.

1.05 QUALITY ASSURANCE

A. Substrate Tests: Have samples of actual substrate materials tested by manufacturer of sealer products.
   1. Test to determine what preparation procedures (if any) are necessary to make sealers adhere properly under environmental conditions that may occur during installation.
   2. Test to determine compatibility with substrates, backers, and secondary seals, if any.
   3. Use manufacturer's standard test methods.
   4. Report the sealer manufacturer's recommendations for substrate preparation and sealer installation and identify specific primer(s) required.
   5. The requirement for testing for this project will be waived if test reports based on previous testing of the products and substrates to be used are acceptable to the Architect.

B. See Section 01 91 25 - Building Enclosure Commissioning for additional requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

1.07 PROJECT SITE CONDITIONS

A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
   1. Air or substrate temperature exceeds the range recommended by sealer manufacturer or is below 40 deg F (4.5 deg C) or is above 100 deg F (38 deg C).
   2. Substrate is wet, damp, or covered with snow, ice, or frost.
   3. Substrate is dusty, oily, or otherwise contaminated.

B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Architect and get joint sealer manufacturer's recommendations for alternative procedures.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 WARRANTY

A. Submit a written warranty signed by the Contractor guaranteeing to correct failures in joint sealer work within a five year period after Date of Final Acceptance, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Provide sealants and sealant primers for interior applications complying with South Coast Air Quality Management District (SCAQMD) Rule No. 1168 VOC limits as follows:
   1. Architectural Sealant: Not more than 250 g/l.
   2. Sealant Primers for Nonporous Substrates: Not more than 250 g/l.

2.02 SEALANTS

A. High Movement Silicone Sealant: One- or two-part, non-acid-curing, ASTM C920, Grade NS, Class 25, Use NT, plus movement capability of 50 percent in extension, 50 percent in compression.
   1. Products:
      a. Dow; Dowsil 756SMS, 790, or 795: www.dow.com (60 g/l), (26 g/l), (32 g/l)
      b. Momentive GE Silicones; SilPruf9000 NB, SCS2000 SilPruf Sealant, or SCS2700 SilPruf LM Sealant: www.siliconeforbuilding.com (37 g/l), (20 g/l), (27 g/l)
      c. Sika Corporation; Sikasil WS-290 or WS-295: usa.sika.com (29 g/l), (37 g/l)

B. Mildew-Resistant Silicone Sealant: One-part, ASTM C920, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.

1. Products:
    a. Dow; Dowsil 786: www.dow.com (36 g/l)
    b. Momentive GE Silicones; SCS1700 Sanitary: www.siliconeforbuilding.com (20 g/l)
    c. Sika Corporation; Sikasil N-Plus: www.sika.com (37 g/l)

C. Butyl Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses NT; single component, solvent release, non-skinning, nonsag.
1. Products:
    a. de Van Sealant, Inc.; 275.12 Non-Skinning, Standing Seam Pumpable Butyl Caulk: www.devansealants.com.
    b. Edge Adhesives; Rubex Non-Skinning Butyl Sealant: www.edgeadhesives.com.
    c. Pecora Corporation; BA-98: www.pecora.com (53 g/l)

D. Concealed Sealant in Contact with Weather-Resistant Membrane: Silicone for Low-Energy Substrates:
1. Products:
    a. Dow; Dowsil 758 Silicone Weather Barrier Sealant: www.dow.com (61 g/l)
    b. Momentive GE Silicones; SCS 2700 Silpruf LM: www.silconeforbuilding.com (20-27 g/l)
    c. Tremco; Spectrem 1: www.tremco.com.

E. Non-Curing Sealers:
1. Butyl Polyisobutylene Tape Sealer: Solvent-free, 100 percent solids; complying with 804.3, as described in AAMA 800; nonstaining and nonmigrating; provide in rolls with release paper.
    a. Integral shimming spacer.

2.03 ACCESSORIES

A. Primer for Silicone Sealants: Nonstaining type, as recommended by joint sealant manufacturer for specific substrates encountered on the project and as verified by testing.

B. Joint Cleaner: Noncorrosive and nonstaining type, recommended by sealant manufacturer; not damaging to substrates, and compatible with joint forming materials.

C. Backer Rods: Flexible, nonabsorbent, compressible polyethylene foam, either open cell or nongassing closed cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

D. Bond-Breaker Tape: Self-adhesive, polyethylene or other plastic tape, unless otherwise restricted by sealant manufacturer; suitable for preventing sealant adhesion.

E. Masking Tape: Nonabsorbent, nonstaining.

F. Tooling Agents: Approved by sealant manufacturer; nonstaining to sealant and substrate.

2.04 SEALANT COLORS

A. The Architect will select sealant colors from manufacturer's full range of available colors for each respective sealant and adjacent substrate.

B. Obtain approval of mock-up color before ordering job quantities of sealant.

C. Required colors:
1. Brick to brick expansion joint.
2. Brick to cast stone.
3. Brick to aluminum or steel framing.
4. Cast stone to cast stone.
5. Cast stone to aluminum or steel framing.
6. Aluminum or steel framing to aluminum or steel framing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints for characteristics that may affect sealer performance, including configuration and dimensions.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Cleaning: Just before starting sealer installation, clean out joints as follows:
   1. Remove loose materials and foreign matter which might impair adhesion of sealant including, but not limited to, dust, dirt, coatings, paint, oil, and grease.
   2. Dry out damp and wet substrates thoroughly.
   3. Clean A-type and G-type substrates by chemical or other methods that will not damage the substrate.
   4. Remove loose particles by brushing and by blowing with oil-free compressed air.
   5. Concrete: Remove laitance and form-release coatings.
   6. Use methods which will not leave residues that will impair adhesion.

B. Prime joint substrates where required by this specification, manufacturer's recommendations, or adhesion tests.

C. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape at the end of each day.

D. Protect elements surrounding the work of this section from damage or disfigurement.

E. Install fillers where needed to provide proper joint depth or support for sealant backers.

F. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

B. Comply with sealer manufacturer's installation instructions and recommendations, except where more restrictive requirements are specified.

C. Gunnable and Pourable Sealants: Comply with recommendations of ASTM C1193.

D. Backers:
   1. Install backers at depth required to result in shape and depth of installed sealant which allows the most joint movement without failure.
      a. Make backers continuous, without gaps, tears, or punctures.
      b. Do not stretch or twist backers.
   2. Use bond-breaker tape wherever it is necessary to keep sealant from adhering to back or third side of joint.
   3. If backers become wet or damp before installation of sealant, dry out thoroughly before proceeding.

E. Shape and Depth: Use methods recommended by manufacturer; completely fill the joint; make full contact with bond surfaces; tool nonsag sealants to smooth surface eliminating air pockets.
   1. Use concave joint shape shown in Figure 8 in ASTM C1193, where not otherwise indicated.
   2. Floor Joints: Use recessed joint shape shown in Figure 8 in ASTM C1193, of 1/4 inch (6 mm) deep and recessed 1/8 inch (3 mm) from face of joint. Use masking tape to protect adjacent surfaces of recessed tooled joints.
   3. Depth of sealant at center of joint, unless otherwise required by the Contract Documents or recommended by manufacturer:
      a. For joints up to 1/4 inch (6 mm) wide: Depth equal to width.
      b. For joints 1/4 to 1/2 inch (6 to 13 mm) wide: Depth equal to 1/4 inch (6 mm).

c. For joints over 1/2 inch (13 mm) wide: Depth equal to 1/2 inch (13 mm) the width but not deeper than 1/2 inch (13 mm).

4. Contact depth: Twice the depth of sealant at center of joint, unless otherwise required.

3.04 COORDINATION OF INTERIOR WALL AND CEILING JOINTS WITH PAINTS AND SPECIAL COATINGS

A. Joints in Surfaces to Receive Paint (typ. latex):
   1. Sealant-Type Expansion Joints in Gypsum Wallboard:
      a. Install backer rod and joint sealant, and allow to cure prior to application of paint.
   2. Control and Expansion Joints in Concrete and CMU:
      a. Ensure that coatings are applied to the joint face, approximately 1/2 inch (13 mm) deep, and have cured.
      b. Install backer rod, and adhere joint sealant to the cured coating.
   3. Fillet Joints between Hollow Metal Door Frames and Adjacent Walls (and similar locations):
      a. Install backer rod and joint sealant, and allow to cure prior to application of paint.

B. Joints in Surfaces to Receive High Performance Coatings (typ. epoxy or urethane):
   1. Control and Expansion Joints in Concrete, CMU, and Gypsum Wallboard:
      a. Ensure that coatings are applied to the joint face, approximately 1/2 inch (13 mm) deep, and have cured.
      b. Install backer rod, and adhere joint sealant to the cured coating.
   2. Fillet Joints between Hollow Metal Door Frames and Adjacent Walls (and similar locations):
      a. Ensure that coatings are applied and have cured.
      b. Install backer, and adhere joint sealant to the cured coating.

3.05 CLEANING

A. Clean adjacent soiled surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.

3.06 PROTECTION OF FINISHED WORK

A. Protect sealants from contamination and damage until cured.

B. Remove and replace damaged sealers.

3.07 FIELD INSTALLATION TESTS:

A. Before installation, install samples and test the adhesion of each type of sealers to each type of actual substrates. Do initial field adhesion hand-pull tests in the presence of the sealant manufacturer's representative. Report results.

B. Field Tests on Installed Sealants: Perform periodic tests for each combination of exterior sealer and substrate.
   1. Perform tests at a rate of ten tests for the first 1,000 feet (305 m). Thereafter, for each type of sealant being installed on each substrate perform one test per 2,500 sq.ft (232 sq.m) thereafter, or one test per floor per elevation, whichever is greater. Record the test results in a field adhesion test log.

C. For each type of sealant, obtain specific test procedure and pass/fail criteria from sealant manufacturer.

D. Field Test as described in ASTM C1193 Appendix X1.1 - Method A, Field-Applied Sealant Joint Hand Pull Tab:
   1. Seal at least 5 feet (1.5 m) lengths of joints and cure properly.
   2. Perform each test at the job site after the sealant is fully cured.
   3. Make a knife cut horizontally from one side of the joint to the other.
   4. Make two vertical cuts, from the horizontal cut, approximately 3 inches (76 mm) long, at both sides of the joint.
   5. Place a 1 inch (25 mm) mark on the sealant tab.

6. Grasp the 2 inches (50 mm) piece of sealant firmly just beyond the 1 inch (25 mm) mark and pull at a 90 degree angle.
7. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut along one side of the joint, checking adhesion to the opposite side, and then repeating for the other side.
8. Pass criteria: When extended to its rated value, sealant remains intact or sealant tears in cohesion. Fail criteria: Before or at extension to its rated value, sealant releases from either substrate.
9. Inspect the joints for complete fill. The joints should not have voids, and joint dimensions indicated.
10. Repair the sealant pulled from the test area by applying new sealant to the test area. Care should be taken to ensure that the original sealant surfaces are clean and that the new sealant is in contact with the original sealant.

E. Report results.

3.08 SCHEDULE

A. General:
   1. Seal joints in exterior envelope to prevent the entry or escape of water or air.
   2. Seal joints on the interior of the building to prevent the passage of water or air from space to space or between adjacent building materials and assemblies.
   3. Joints of a nature similar to that of joints indicated shall be sealed with same sealer, whether specifically indicated on the drawings and schedules to be sealed or not.

B. Typical Exterior Joints:
   1. Including, but not limited to:
      a. Wall joints.
      b. Joints around perimeter of frames.
      c. Joints around pipes, ducts, and conduit penetrating exterior walls.
      d. Joints in wash surfaces of precast concrete, cast stone, cut stone, or concrete or brick masonry.
      e. Masonry joints with shelf angles.
      f. Exterior joints for which no other sealer is indicated.
   2. Use high movement silicone sealant unless otherwise indicated.

C. Sealant in contact with Weather-Resistant Membrane, concealed from view and concealed from exposure to UV light:
   1. Silicone for low-energy substrates.

D. Metal Flashings:
   1. Including, but not limited to:
      a. Joints in flashing, gravel stops, fascia, and coping and between them and adjacent construction.
      b. Where flashing is inserted into reglet in wall, and top edge of surface mounted reglets.
   2. Use high movement silicone sealant.

E. Concealed Joints in Sheet Metal Flashing and Trim:
   1. Butyl sealant.
   2. Butyl polyisobutylene sealant tape.

F. Exterior Door Thresholds: Set thresholds in butyl sealant.

G. Between Roof Curbs and Mechanical Units : Use butyl polyisobutylene tape sealer.

H. Typical Interior Joints:
   1. Including, but not limited to:
      a. Between walls or partitions and adjacent casework, laboratory furniture, fixed shelving, fixed equipment, lighting fixtures, laboratory piped utility fittings.
      b. Between hollow metal jambs and resilient flooring.
      c. Between hollow metal jambs and concrete flooring that will remain exposed to view.

d. Around penetrations such as electrical boxes, plumbing, cabinets, ducts, and other openings in concrete or masonry walls or partitions. Comply with recommendations and details in USG Corporation's "Gypsum Construction Handbook".
e. Interior joints for which no other sealer is indicated.

2. Use the following sealant:
   a. High movement silicone sealant.

I. Joints in Interior Wet Areas:
1. Including, but not limited to:
   a. Toilet rooms.
   b. Breakrooms.
   c. Between walls or other surfaces and adjacent plumbing fixtures, fittings, and casework.
2. Use the following sealants:
   a. Mildew-resistant silicone sealant.

J. Joints in Floor or Wall Tile:
1. Including locations specified in Section 09 30 00.
2. Use mildew-resistant silicone sealant.
3. Backer: Backer rod.
4. Joint shape: Flush joint configuration.
5. Color: Match adjacent grout color, unless otherwise indicated.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work Included in this Section:
   1. Steel Doors:
      a. Non-fire-resistance rated interior steel doors.
      b. Non-fire-resistance rated exterior steel doors.
      c. Fire-resistance rated interior steel doors.
      d. Thermally insulated steel doors.
   2. Steel Frames:
      a. Non-fire-resistance rated interior steel frames.
      b. Non-fire-resistance rated exterior steel frames.
      c. Fire-resistance rated interior steel frames.
      d. Steel frames in gypsum board partitions.

1.02 REFERENCES

A. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

E. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

F. ITS (DIR) - Directory of Listed Products; current edition.

G. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

H. UL (BMD) - Building Materials Directory; current edition.

I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

L. NAAMM HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

1.03 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

B. Shop Drawings: Details of each opening showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Ceco Door Products: www.cecodoor.com.
2. Republic Builders Products: www.republicdoor.com.
3. Steelcraft: www.steelcraft.com.

2.02 GENERAL

A. Requirements for All Units:
   1. Door Top Closures: Flush with top of faces and edges.
   2. Door Edge Profile: Beveled on both edges.
   3. Door Texture: Smooth faces.

B. Hardware Preparation: In accordance with DHI (LOCS) and DHI WDHS.3, with reinforcement welded in place, in addition to other requirements specified in door grade standard.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Thickness: 1-3/4 inches (44 mm) unless indicated otherwise.

B. Exterior Doors, Non-Fire-Rated:
   1. Grade: ANSI/SDI A250.8 Level 3, 16 ga., physical performance Level A, Model 1, full flush.
   2. Core: Polyurethane.
   3. Top Closures: Flush with top of faces and edges.
   4. Galvanized.
   5. Texture: Smooth faces.
   6. Weatherstripping: Separate, see Door Hardware section.

C. Interior Doors, Non-Fire-Rated:
   1. Grade: ANSI/SDI A250.8 Level 2, 18 ga., physical performance Level B, Model 1, full flush.
   2. Core: Cardboard honeycomb.
   3. Texture: Smooth faces.

D. Interior Doors, Fire-Rated:
   1. Grade: ANSI/SDI A250.8 Level 2, 18 ga., physical performance Level B, Model 1, full flush.
   2. Fire Rating: As indicated on Door and Frame Schedule, with temperature rise ratings as required by code , tested in accordance with UL 10C or NFPA 252 with "positive pressure method" and without the need for applied seals.
      a. Provide units listed and labeled by UL (BMD) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.
   3. Core: Mineral fiberboard.
   4. Texture: Smooth faces.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
      a. ANSI/SDI A250.8 Level 3 Doors: 14 gauge, 0.067 inch (1.70 mm) frames.
   2. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gauge
   3. Finish: Same as for door.
   4. Frames Wider than 48 Inches (1200 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Exterior Door Frames: Full profile / continuously welded type. Thermally broken with 3/8" thick integral polyurethane thermal barrier and compression gasket.

1. Weatherstripping: Separate, see Door Hardware section.

C. Interior Door Frames, Non-Fire-Rated:
1. Gypsum board partitions. Full profile/continuously welded type.

D. Interior Door Frames, Fire-Rated:
1. Gypsum board partitions. Full profile/continuously welded type.
2. Fire Rating: Same as door, labeled.

2.05 ACCESSORY MATERIALS

A. Glazing:
1. As specified in Section 08 80 00.

B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating. Factory-prime galvanized units.
1. Galvanize exterior units.

B. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Coordinate installation of hardware.

E. Coordinate installation of glazing.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.03 ERECTION TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI/SDI A250.8.

B. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Solid core veneer-faced doors with a transparent finish.
   2. Fire-resistance rated doors.
   3. Factory finishing.
   4. Glazing stops and preparation of flush doors to receive glazing; glazing specified elsewhere.
   5. Prefitting by manufacturer.
   6. Premachining by manufacturer.

1.02 REFERENCES

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

E. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata.

1.03 SUBMITTALS

A. Product Data: Submit detailed technical information for each distinct product specified in this section. Include complete data for factory finished doors.

B. Submit evidence of membership in AWI.

C. Shop Drawings: Prepare and submit shop drawings showing relevant information, including:
   1. Dimensions and location of each product specified.
   2. Elevation for each distinct door configuration.
   3. Construction details for each distinct product type.
   4. Dimensions and location of blocking for hardware.
   5. Fire ratings.
   6. Factory finishing details.

D. Samples: Submit samples for the following:
   1. Veneer verification samples: Minimum 8-1/2 x 11 inches (216 x 280 mm).
   2. Factory finishes:
      a. Verification samples: Minimum 8 inches (200 mm)-square sample for each color, effect, and type of factory finish.
   3. Glazing assemblies: For each type and finish, provide minimum 12 inches (305 mm)-long sample.

E. Certificates:
   1. Submit certification that manufacturer's construction standards and tested fire door assembly requirements comply with contract requirements indicated for doors, hardware, hardware templating, size of lights, and other design characteristics.
      a. Clearly note any exceptions to certification, citing door number and hardware set. Exceptions shall be subject to the approval of the Architect.
   2. Submit AWI (QCP) "Architectural Quality Certification Program" Inspection Service Report; on-site inspection is not required.

1.04 QUALITY ASSURANCE

A. Manufacturer: Member of AWI (QCP).

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products as required to prevent damage or deterioration. Conform to manufacturer's recommendations, requirements of referenced standard, and recommendations of WDMA I.S. 1A, Appendix, "How to Store, Handle, Finish, Install, and Maintain Wood Doors."

B. Clearly label each door with opening number where door will be installed. Use removable, temporary labels or mark on door surface which will be concealed from view after installation.
   1. Coordinate door identification with shop drawing designations.

C. Environmental Requirements: Do not deliver, store, or install products of this section before building's design temperature and humidity levels have been achieved and will be maintained at those levels.

1.06 WARRANTIES

A. Manufacturer's Warranty (Interior Doors):
   1. Submit a written warranty signed by the manufacturer guaranteeing to correct failures in products which occur within the warranty period indicated below, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents. Failures are defined to include:
      a. Faulty workmanship.
      b. Delamination.
      c. Stile, rail, or core show-through (telegraphing) visible to the naked eye to any degree when viewed from a horizontal distance of 3 to 4 feet (0.9 to 1.2 m).
      d. Warp (including bow, cup, and twist) in excess of 1/4 inch (6 mm) when measured in accordance with WDMA I.S. 1A.
   2. Correction includes repair or replacement at the option of the Architect. Correct failures which occur within the following warranty periods after Final Acceptance:
      a. Solid core interior doors: Life of original installation.

B. If, for any reason, the Contractor's work results in nullification of manufacturer's warranty, the Contractor shall correct failures and pay for such correction.

PART 2 PRODUCTS

2.01 ENVIRONMENTAL REQUIREMENTS

A. Materials and Resources - Recycled Content.

B. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants.
   1. Multipurpose Construction Adhesives: 70 g/l.

C. Indoor Environmental Quality - Low-Emitting Materials - Composite Wood & Agrifiber Products.
   1. Composite Wood and Agrifiber Products: Composite wood and agrifiber products used on the inside of the building (inside of the weatherproofing system) shall contain no added urea formaldehyde resins.
      a. Laminating adhesives used to fabricate on-site and shop applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

2.02 WOOD DOORS - GENERAL REQUIREMENTS

A. Flush Doors: Conform to one of the following:
   1. WDMA I.S. 1A: "Industry Standard for Interior Architectural Wood Flush Doors".
   2. AWI/AWMAC/WI (AWS) "Architectural Woodwork Standards".

B. Door Performance Grade: Heavy Duty.

C. Fire-Rated Doors:
   1. Provide doors that comply with NFPA 80 and that are precise duplicates of doors tested as part of fire-rated assemblies in accordance with requirements of UL 10C or NFPA 252 with "positive pressure method". Seals shall not be visible when door is open. Do not employ frame-applied seals.
   2. Acceptable testing and inspection agencies:

a. Underwriters Laboratories Inc.
b. Warnock Hersey International Inc.

3. Construction: Conform to testing agency requirements for indicated fire rating.
   a. Ratings of 45 minutes or more: Mineral core.
   b. Ratings of 20 minutes: Particleboard core.
   c. Temperature rise rating: For fire-rated doors in stairwell enclosures, provide door construction tested and certified to limit temperature rise in thirty minutes to 450 deg F (232 deg C).
4. Edges: Laminated edge (stile) designed for use with mortise hinges and appropriate for indicated fire resistance rating.
5. Rails and blocking: Laminated material designed for use as blocking or rails and appropriate for indicated fire resistance rating. Provide the following for fire rated doors with 45-minute or greater rating:
   a. All doors: Provide 5 inches (127 mm)-wide top and bottom rails; provide lock blocking.
   b. Doors with exit devices: Provide lock blocking both sides or continuous intermediate rail.
   c. Doors with flush or surface bolts: Provide blocking for bolts.
   d. Doors, transoms, or side panels with strikes: Provide blocking for strikes.
6. Acceptable products for edges, rails, and blocking:
   a. "Firestop I" for blocking and rails, "Firestop II" for stiles; Georgia-Pacific.
   b. "SLM" for blocking and rails, "SLM II" for stiles; Timberland Components.
   c. "Triple-Ply"; Weyerhauser.
   d. Other products acceptable to manufacturer, subject to the approval of the Architect.
7. Through-bolted hardware: Blocking specified in this section shall not relieve the requirement for through-bolted closers, exit devices, and similar hardware. Through-bolted closers, exit devices, and similar hardware specified shall not relieve the requirement for solid blocking. Provide through-bolted hardware and solid blocking.
8. Pairs of fire rated doors: Where required to meet fire rating, provide metal meeting edges at pairs of vertical rod exit devices, and astragals and metal edges elsewhere.
   a. At veneered doors with transparent finish, cover metal with matching veneer.
   b. At opaque field finished doors, provide metal primed for painting.
   c. At doors with opaque factory finish (paint or HPDL), apply baked enamel factory finish to metal to match door finish.
9. Testing laboratory labels: Permanently affixed to hinge stile.
   a. Construction labeling is not an acceptable to standard labeling unless requested in accordance with the substitution procedures specified in Division 01 and approved in writing by the Architect.

2.03 CONSTRUCTION

A. Appearance Grade: Premium.

B. Faces:
   1. Veneer species, cut, and grade for transparent finish (HPVA standards):
      a. HPVA Grade AA.
      b. White Oak, Rift Cut.
   2. Veneer matching for transparent finish:
      a. Between adjacent veneer leaves: Book Match.
      b. Within panel face: Running match.

C. Construction: PC-5 (5-ply).

D. Core, Non-Fire-Rated Doors: Particleboard, bonded to stiles and rails, sanded.

E. Core, Fire Rated Doors: As specified above.

F. Core, Glass Light Doors: Where stile width is less than 10 inches (254 mm), or where glass height is over 1/2 of the height of the door, or where other required features do not qualify for

manufacturer's standard construction, provide specially reinforced core construction utilizing laminated strand lumber or other materials approved by the Architect.

G. Door Thickness: 1-3/4 inch (44 mm) unless indicated otherwise.

H. Transom Panels: To match; Bottom edge rabbeted with top of door.

I. Glue: Type I.

2.04 ACCESSORIES

A. Stops for Glazing: Provide flush style glazing stops.
   1. For non-fire-rated doors: Solid stock of species to match door face veneer; finish to match door.
   2. For fire rated doors 45 minutes and over: Cold-rolled sheet steel of gauge approved by testing agency for installation in fire-rated doors indicated. Cover exposed surfaces of glazing stops with wood veneer to match door faces. Finish veneer to match door.
   3. For 20 minute fire-rated doors: Solid stock fire-retardant treated wood of species to match door face veneer; finish to match door.

2.05 FABRICATION

A. General:
   1. Fabricate to provide consistent clearances as indicated.
   2. Hinge and lock edges:
      a. Provide 1/8 inch (3 mm) standard bevel at edges, unless standard bevel would not precisely match hardware bevel; provide proper bevel for hardware.
      b. Predrill pilot holes for hinges on fire doors with laminated hinge stiles.
   3. Make neat mortises and cutouts for door hardware indicated.
   4. Prefitting: Fabricate and trim doors to size at factory to coordinate with frame shop drawings and floor finishes as indicated in the finish schedule.
      a. Provide non-standard clearances and tolerances indicated in Part 3.
   5. Premachining: Make all mortises and cutouts required for hardware at the factory to conform to approved hardware schedule, hardware templates, and door frame shop drawings.

B. Fixed Panels: Provide panels of same quality, construction, and appearance as adjacent doors
   1. Grain and pattern matching: Conform to requirements of referenced standard for matching of faces between doors and panels.
   2. Transom panels: Mark top edge of transom panel to ensure correct orientation in opening.

C. Openings: Cut, trim, and seal openings in doors at the factory.

2.06 FACTORY FINISHING

A. Comply with one of the following:
   1. AWI/AWMAC/WI (AWS) Section 5, "Factory Finishing".
   2. WDMA I.S. 1A "Finishing".

B. Transparent Finish:
   1. WDMA I.S. 1A System TR-6 Catalyzed Polyurethane or TR-8 UV Cured Acrylated Polyester/Urethane.
   2. AWI/AWMAC/WI (AWS)AWI System 11 Catalyzed Polyurethane or System 9 UV Cured Acrylated Polyester/Urethane.
   3. Sheen: Satin.
   4. Staining: Match the Architect's sample.
   5. Grade: Premium.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect door frames and doors before beginning door installation.

1. Verify that frames are properly installed and aligned and are capable of providing trouble free support for doors throughout range of door swing.
2. Do not install damaged or defective doors.
3. Do not install doors with veneer not meeting requirements of specified Grade.

B. Correct unsatisfactory conditions before installing products of this section. Commencement of installation indicates acceptance of conditions.

3.02 INSTALLATION

A. Hardware Installation: Elsewhere in Division 08.

B. Install doors in accordance with manufacturer's recommended procedures and requirements of referenced standard.
1. Fire-rated doors: Comply with NFPA 80 requirements.

C. Prefit Doors: Minimize field fitting to those procedures which are necessary to complete work unfinished during factory prefitting and to provide trouble free operation.
1. Accurately align and fit doors for trouble free operation throughout range of door swing.

D. Prefitting Clearances:
1. Door edge and head: 1/8 inch (3 mm).
2. Door edge and jamb: 1/8 inch (3 mm).
3. Door bottom edge and top surface of threshold: 1/4 inch (6 mm).
4. Door bottom edge and floor covering surface or finish (where threshold is not indicated): 1/8 inch (3 mm).
5. Meeting edges at pairs of doors: 1/8 inch (3 mm) total.

E. Installation Clearances: Install doors so as to maintain prefitting clearances specified.

F. Factory-Finished Doors: Before installing doors, restore finish at door edges cut during field fitting.

3.03 ADJUSTING

A. Adjust doors for proper operation; coordinate with hardware adjustment; replace doors that cannot be properly adjusted.

B. Where door finishes are damaged during installation, restore in a manner that results in the door showing no evidence of the restoration. If refinished door cannot be made to match other doors, remove refinished door and replace with new conforming work at the Contractor's expense.

C. Protect installed work.

END OF SECTION

SECTION 08 31 00 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Wall- and ceiling-mounted access units.

B. Furnishing and installing access doors whether indicated or not is the sole responsibility of the Contractor. Coordinate location of access panels with the Architect prior to installation as part of ceiling coordination process indicated in Section 09 05 10.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

B. Project Record Documents: Record actual locations of each access unit.

1.04 QUALITY ASSURANCE

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Panel Material: Steel.
   2. Size: 12 by 12 inches (305 by 305 mm).
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

B. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: 1 hour.
   2. Panel Material: Steel.
   3. Size: 12 by 12 inches (305 by 305 mm).
   4. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

C. Ceiling-Mounted Units:
   1. Panel Material: Steel.
   2. Size: 24 by 24 inches (610 by 610 mm).
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Door Style: Single thickness with rolled or turned in edges.
   2. Frames: 16-gauge, 0.0598-inch (1.52 mm) minimum thickness.
   3. Single Steel Sheet Door Panels: 16-gauge, 0,0625-inch (1.6 mm) minimum thickness.
   4. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
      a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.

5. Steel Finish: Primed.
6. Hardware:
   a. Hardware for Fire-Rated Units: As required for listing.
   b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 33 23.13 - OVERHEAD RAPID COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead high-speed coiling doors, operating hardware.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. DASMA 402 - Specification for High Performance Doors and Grilles; 2020.

D. DASMA 403 - Specification for High Speed Doors and Grilles; 2020.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

H. NEMA MG 1 - Motors and Generators; 2018.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide general construction, electrical equipment, and component connections and details.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

C. Specimen warranties.

1.04 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.05 WARRANTY

A. Manufacturer Warranty: Provide five-year manufacturer warranty for motor and gearbox. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Rapid Coiling Fabric Doors:

1. ASI Doors Inc; Model 415 Iso-Roll: www.asidoors.com.
2. Hormann High Performance Doors; Speed-Commander Series - Model 1400 SEL Clean-Master 20 Pa for Clean Rooms: www.hormann-flexon.com.
3. Rytec Corporation; Pharma-Seal PS2000: www.rytecdoors.com.

2.02 PERFORMANCE REQUIREMENTS

A. Performance Standards: DASMA 402 and DASMA 403 requirements for high performance doors.

B. Durability: Design doors to operate at a minimum of 100,000 cycles when properly selected, installed, operated, and maintained.

C. Rapid Coiling Doors Operation-Cycles Per Day Requirements: Minimum of 100, averaged on a yearly basis.

2.03 RAPID COILING DOORS

A. Non-Fire-Rated Interior High-Speed Coiling Clean Environment Fabric Doors: Reinforced polyvinyl chloride (PVC) curtain.
   1. Door Opening Speed: Variable, adjustable, up to 60 inches (1500 mm) per second.
   2. Door Closing Speed: 30 inches (750 mm) per second.
   3. Flexibility: Provide curtain that is stiff in the horizontal direction and flexible in the vertical direction.
   4. FDA Regulatory Compliance: Design doors with components with minimum of areas and materials that can trap and hold particles and bacteria, and allow for fast, easy, and thorough cleaning.
      a. Fabric: Smooth reinforced PVC fabric.
      b. Side Frames: Noncorrosive, removable to facilitate cleaning concealed surfaces.
      c. Drive System and Controls: Wash-down rated.
   5. Two-ply door curtain fabric, 71 oz/sq yd (2400 g/sq m) nominal.
   6. Fabric Color: As selected by Architect from manufacturer's standard colors.
   7. Side Guides, Channels: Galvanized steel.
   8. Side Guide Covers, Formed Sheet Metal: Galvanized steel.
   9. Hood Enclosure: Manufacturer's standard.
   10. Electric operation.
   11. Mounting: Surface mounted.

2.04 COMPONENTS

A. Fabric Curtain Construction: Manufacturer's standard fabric for door type and model selected.
   1. Continuous Design: Curtain comprised of a single length of fabric.
   2. Soft Curtain Bottom for Fabric Curtains: Soft edge without hard, rigid, or stiff parts; designed to initially dislodge curtain from the tracks when an obstruction encountered in the vertical closing path exerts force of 12 pounds-force (53.4 N) or more.
      a. Manufacturer's standard leading-edge bottom seal, replaceable without need for welding or tools.

B. Coiling Door Guide Construction: Continuous sheet metal, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
   1. Galvanized Steel Guides: ASTM A36/A36M steel angles, size as indicated, hot-dip galvanized per ASTM A123/A123M.

C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.

D. Fabric Tensioning System: Manufacturer's standard; separate from counterbalance system.

2.05 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators: UL listed.
   1. Usage Classification: Heavy duty, rated up to 60 cycles per hour under constant load.
   2. Mounting: Side mounted.
   3. Motor Enclosure:
      a. Interior Coiling Doors: NEMA MG 1, Type 1; open drip proof.
   4. Motor Rating: 2 HP (1500 W); continuous duty.
   5. Motor Voltage: 120 volts, single phase, 60 Hz.
   6. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   7. Washdown Applications Controller Enclosure: NEMA 250, Type 4X.

8. Opening Speed: Up to 60 inches per second (1500 mm/sec).
9. Brake: Manufacturer's standard type, activated by motor controller.
10. Manual override in case of power failure.
11. See Section 26 05 83 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button "Open-Close-Stop" momentary-contact control device for each operator complying with UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Programmable Inputs and Outputs: Design to accommodate special control applications such as traffic lights, horns, actuation devices, timing sequences, and others.
4. Display Type: Self-diagnostic scrolling two-line fluorescent.
5. Door Travel Limit Regulation: Self adjusting, not requiring use of tools.
6. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
   a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

E. Fabric Curtain Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, with internal wireless transmitter signaling controller to stop and reverse door direction upon striking object.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building structure without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 05 83.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.02 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).

C. Maximum Variation From Level: 1/16 inch (1.6 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.03 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

END OF SECTION

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

E. DASMA 102 - American National Standard Specifications for Sectional Doors; 2018.

F. ITS (DIR) - Directory of Listed Products; current edition.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

H. NEMA MG 1 - Motors and Generators; 2018.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL (DIR) - Online Certifications Directory; Current Edition.

L. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

B. Product Data: Show component construction, anchorage method, and hardware.

C. Samples: Submit two panel finish samples, 4 by 6 inch (100 by 150 mm) in size, illustrating color and finish.

D. Operation Data: Include normal operation, troubleshooting, and adjusting.

E. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Comply with applicable code for motor and motor control requirements.

B. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.05 WARRANTY

A. Correct defective Work within a five year period after Date of Final Acceptance.

B. Warranty: Include coverage for electric motor and transmission.

C. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
1. Clopay Building Products; Model 904U: www.clopaydoor.com.
2. Raynor Garage Doors; AlumaView, Model AV200: www.raynor.com.
3. Wayne-Dalton, a Division of Overhead Door Corporation; K-AL: www.wayne-dalton.com.

2.02 ALUMINUM DOORS

A. Aluminum Doors: Stile and rail aluminum with glazed panels; high lift operating style with track and hardware; complying with DASMA 102, Commercial application.
1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
2. Door Nominal Thickness: 2 inches (50 mm) thick.
3. Thermal Transmittance: U-factor (Usi-factor) of 0.31 Btu/hr sq ft degrees F (1.76 W/sq m K), maximum, in accordance with DASMA 102.
4. Air Leakage Rate: Less than 0.40 cfm/sf (2.0 L/sec/sq m) when tested in accordance with ASTM E283 at test pressure difference of 1.57 psf (75 Pa).
5. Finish: Factory finished with powder coat; custom color to match Architect's sample.
6. Glazed Lights: Full panel width, all rows; set in place with resilient glazing channel.
7. Manual Operation: Chain hoist.
8. Electric Operation: Electric control station.

B. Glazing: Fully tempered glass; insulated glass units; clear; 1 inch (25.4 mm) overall thickness.

2.03 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch (2.3 mm) minimum thickness; 2 inch (50 mm) wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch (6 mm) thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
1. For Manual Operation: Requiring maximum exertion of 25 lbs (110 N) force to open.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

I. Lock Cylinders: See Section 08 71 00.

2.04 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

C. Float Glass: Provide float glass glazing, unless noted otherwise.
1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

2.05 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
      a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
   3. Motor Rating: 1/3 hp (250 W); continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA 250, Type 1.
   7. Opening Speed: 12 inches per second (300 mm/s).
   8. Brake: Adjustable friction clutch type, activated by motor controller.
   9. Manual override in case of power failure.
   10. Refer to Section 26 05 83 for electrical connections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

E. Provide interconnection to security system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.02 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 ft (3 m) straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.03 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

END OF SECTION

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum doors and frames.

B. Storefront.

C. Glass infill.

1.02 REFERENCES

A. AA DAF-45 - Designation System for Aluminum Finishes; 2003 (Reaffirmed 2009).

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2018, with Editorial Revision.

E. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018.

1.03 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glazing and infill, and internal drainage details.

B. Samples: Submit three samples 4 X 6 inches (100 x 150 mm) in size illustrating finished aluminum surface, glazing, glazing materials.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.

1. Structural Glazing Adhesive: Data and calculations showing compliance with performance requirements.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS:

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants:

1. Provide adhesives complying with South Coast Rule No. 1168 by the South Coast Air Quality Management District.
   a. Structural Glazing Adhesives: 100 g/l.

2.02 MANUFACTURERS

A. Kawneer Company, Inc: www.kawneer.com.

B. EFCO Corp: www.efcocorp.com.

C. YKK AP America, Inc: www.ykkap.com.

2.03 ALUMINUM ENTRANCE DOORS

A. Kawneer Company, Inc.:

1. 190 Door.

B. EFCO:

1. D200 Narrow Stile.

C. YKK:

1. 20D Narrow Stile.

D. Doors: Glazed aluminum.
1. Overall Thickness: 1-3/4 inches (43 mm).
2. Bottom Rail: 10 inches (254 mm) wide.
3. Glazing Stops: Beveled.
4. Finish: Same as adjacent framing members.

E. Door Hardware: As specified in Section 08 71 00.

2.04 STOREFRONT SYSTEM

A. Kawneer Company, Inc.:
1. Trifab VG 450 (Center).

B. EFCO:
1. Series 401.

C. YKK:
1. YES 45 FS.

D. Performance Requirements:
1. Design and size components to withstand the following load requirements without damage or permanent set:
a. Design Lateral Load (positive or negative): 5 lbf/sq ft (240 Pa).
b. Member Deflection: Limit member deflection to L/175 in any direction or 3/4 inch (20 mm), whichever is less, with full recovery of glazing materials.
c. Glazing deflection: At structural sealant joints, limit differential glazing deflection between adjacent pieces of glass to thickness of glass when 50 plf is applied horizontally to one panel at any point up to 42 inches above the adjacent walking surface.
2. Structural Glazing Adhesive: Limit working stress to 20 psi (138 kPa).

2.05 COMPONENTS

A. Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

B. Aluminum Framing Members: Tubular aluminum sections, drainage holes, and internal weep drainage system.

C. Trim:
1. Extruded: 0.032 inch (0.8 mm) thick aluminum sheet; finish to match adjacent framing members.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221.

B. Fasteners: Stainless steel.

C. Structural Glazing Adhesive: Silicone, neutral cure; formulated specifically for structural sealant glazing and complying with ASTM C1184. Type recommended by framing manufacturer.
1. Ultraviolet radiation resistant for 2000 to 4000 micro-watts minimum for 21 days.
2. Adhesion when subjected to ultraviolet radiation through glass in accordance with ASTM C794 without failure.
3. Minimum adhesion tensile strength of 100 psi (690 kPa).
4. Tested for compatibility with glazing accessories .

D. Glazing: As specified in Section 08 80 00.

E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

F. Glazing Accessories: As specified in Section 08 80 00.

2.07 FINISHES

A. Comply with AA DAF-45 for aluminum finishes required.

B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; custom color to match approved sample.

2.08 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce framing members for imposed loads.

G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Structural Adhesive Glazing: Install glazing adhesive and weatherseal sealant in accordance with aluminum framing manufacturer's and adhesive manufacturer's instructions.

3.03 ENTRANCE DOORS

A. Set thresholds in a bed of mastic and secure.

B. Install hardware using templates provided.
   1. See Section 08 71 00 for hardware installation requirements.

3.04 ERECTION TOLERANCES

A. Storefront Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Sealant Space Between Aluminum Framing and Adjacent Construction: 3/4 +/- 1/8 inch (20 +/- 3 mm), unless indicated otherwise on the drawings.

3.05 ADJUSTING

A. Adjust doors for smooth operation, proper alignment, weather seal, and hardware function.

3.06 CLEANING AND PROTECTION

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

E. Protect finished work from damage.

END OF SECTION

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum doors and frames.

B. Curtainwall.

C. Glass infill.

D. Integrated custom sun screen.

E. Perimeter sealant.

1.02 REFERENCES

A. AA DAF-45 - Designation System for Aluminum Finishes; 2003 (Reaffirmed 2009).

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

C. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2018, with Editorial Revision.

H. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018.

I. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

M. AAMA 511 - Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products; 2008.

N. ASTM E 783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2018.

1.03 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glazing and infill, and internal drainage details.

B. Samples: Submit three samples 4 X 6 inches (100 x 150 mm) in size illustrating finished aluminum surface.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required. Indicate locations of concealed door closers, exit signs, and fire alarm devices shown

to be mounted directly to curtain wall or storefront mullions and associated conduit and junction boxes within curtain wall system.

D. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.
   1. For curtainwall, include engineering calculations bearing the seal on an engineer licensed to practice in the State in which the Project is located.
   2. Structural Glazing Adhesive: Data and calculations showing compliance with performance requirements.
   3. Include fixed sun shades and custom integrated sun screens in calculations.

E. Report of field testing for water leakage.

F. Project Closeout Submittals: Warranty.

1.04 QUALITY ASSURANCE

A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. See Section 01 91 25 - Building Enclosure Commissioning for additional requirements.

1.05 MOCK-UP

A. See Section 01 40 00 Quality Requirements, for general requirements for mock-ups.

B. Provide mock-up including all components occurring on project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.

C. Locate on-site where directed. Mock-up may not remain as part of the Work.

1.06 PROJECT CONDITIONS

A. Coordinate the work with installation of weather resistant barrier/membrane to adjacent materials.

B. Coordinate the work with installation of firestopping at edge of slab.

C. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

A. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS:

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants:
   1. Provide adhesives complying with South Coast Rule No. 1168 by the South Coast Air Quality Management District.
      a. Structural Glazing Adhesives: 100 g/l.

2.02 MANUFACTURERS

A. Kawneer Company, Inc: www.kawneer.com.

B. EFCO Corp: www.efcocorp.com.

C. YKK AP America, Inc: www.ykkap.com.

2.03 ALUMINUM ENTRANCE DOORS

A. Kawneer Company, Inc.:
   1. 350 Heavy Wall.

B. EFCO:
   1. D318 Durastile.

C. YKK:
   1. 40M Monumental.

D. Doors: Glazed aluminum.
   1. Overall Thickness: 1-3/4 inches (43 mm).
   2. Top Rail: 4 inches (100 mm) wide.
   3. Vertical Stiles: 4-1/2 inches (115 mm) wide.
   4. Bottom Rail: 10 inches (254 mm) wide.
   5. Glazing Stops: Beveled.
   6. Finish: Same as adjacent framing members.

E. Performance Requirements:
   1. Design and size components to withstand the following load requirements without damage or permanent set:
      a. Design Wind Pressure: As indicated on the Structural Drawings for components and cladding.
      b. Member Deflection: Limit member deflection to L/175 in any direction or 3/4 inch (19 mm), whichever is less, with full recovery of glazing materials.
      c. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Movement between aluminum framing and perimeter framing.
   3. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft (0.0003 cu m/s/sq m) of wall area, measured at a reference differential pressure across assembly of 6.24 psf (300 Pa) as measured in accordance with ASTM E283.
   4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   5. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

F. Door Hardware: As specified in Section 08 71 00.

G. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

H. Sill Sweep Strips: Resilient seal type, of neoprene; provide on all doors.

I. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior doors.

J. Automatic Door Operators and Actuators: As specified in Section 08 71 00.

2.04 CURTAINWALL SYSTEM

A. Kawneer Company, Inc.:
   1. 1600UT System 1.
   2. 1600UT System 2.

B. EFCO:
   1. 5600 X-Therm.

C. YKK:
   1. YCW 750 XT.

D. Performance Requirements:
   1. Design and size components to withstand the following load requirements without damage or permanent set:

a. Design Wind Pressure: As indicated on the Structural Drawings for components and cladding.
b. Member Deflection: Limit member deflection to L/175 in any direction, and without exceeding the flexure limit of glass, and maximum of 3/4 inch (19 mm), with full recovery of glazing materials.
c. Measure performance by testing in accordance with ASTM E330/E330M using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.

2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with the building code.
3. Movement: Accommodate the following movement without damage to components or deterioration of seals:
   a. Movement of curtain wall relative to perimeter framing.
   b. Deflection of structural support framing, under permanent and dynamic loads.
   c. Shortening of structural concrete columns.
   d. Creep of structural concrete members.
   e. Interstory drift of 0.25 inch (6 mm).
   f. Mid-span slab edge deflection of 0.50 inch inch (12 mm).
4. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft (0.0003 cu m/s/sq m) of wall area, measured at a reference differential pressure across assembly of 6.24 psf (300 Pa) as measured in accordance with ASTM E283.
5. Water Leakage: None, when measured in accordance with ASTM E331 at the following test pressure differences:
   a. Kawneer 1600UT System 1: 12 psf (575 Pa).
   b. Kawneer 1600UT System 2: 12 psf (575 Pa).
   c. EFCO 5600 X-Therm: 15 psf (718 Pa).
   d. YKK 750 XT: 15 psf (718 Pa).
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
9. Design system to eliminate noises caused by wind and thermal movement, to prevent vibration harmonics, and to prevent "stack effect" in internal spaces.
10. Structural Glazing Adhesive: Limit working stress to 20 psi (138 kPa).

2.05 COMPONENTS

A. Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

B. Aluminum Framing Members: Tubular aluminum sections, drainage holes, and internal weep drainage system.

C. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

D. Fixed sun screens: As specified in Section 10 71 13.43.

E. Custom integrated sun screens: As indicated in Drawings.

F. Trim:
   1. Extruded: 0.032 inch (0.8 mm) thick aluminum sheet; finish to match adjacent framing members. Configurations as shown in Drawings.

G. Concealed Flashings: 0.018 inch (0.5 mm) thick stainless steel.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221.

B. Sheet Aluminum: ASTM B209.

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A 123/A 123M.

D. Fasteners: Stainless steel.

E. Structural Glazing Adhesive: Silicone, neutral cure; formulated specifically for structural sealant glazing and complying with ASTM C1184. Type recommended by framing manufacturer.
   1. Ultraviolet radiation resistant for 2000 to 4000 micro-watts minimum for 21 days.
   2. Adhesion when subjected to ultraviolet radiation through glass in accordance with ASTM C794 without failure.
   3. Minimum adhesion tensile strength of 100 psi (690 kPa).
   4. Tested for compatibility with glazing accessories .

F. Glazing: As specified in Section 08 80 00.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 80 00.

I. Perimeter Seal Materials:
   1. Air Seal:
      a. Dow; Dowsil 758 Silicone Weather Barrier Sealant: www.dow.com (61 g/l)
   2. Weather Barrier Seal - Preformed Silicone Sheet Seal:
      a. Typical Condition: Provide factory molded, cured silicone sheet for glazing into glazing pocket. Include factory molded corners and intersections.
      b. Exception, where indicated on the drawings: Provide gunnable silicone.
      c. Products:
         1) Dow; Dowsil Silicone Transition Strip STS set in Dowsil 758 Silicone Weather Barrier Sealant (61 g/l).
         2) Momentive; GE UltraSpan UST / USM set in SilPruf sealant.
         3) Sika; Silbridge-300 set in Sikasil WS-295 sealant (37 g/l).
   3. Weather Seal: High movement silicone sealant specified in Section 07 92 00.

2.07 FINISHES

A. Comply with AA DAF-45 for aluminum finishes required.

B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; custom color to match approved sample.

2.08 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce framing members for imposed loads, including fixed sun shades and custom integrated sun screens.

G. Provide end caps at ends of all horizontal and vertical mullions where exposed on exterior.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glazing in accordance with framing manufacturer's instructions and reference standards specified in Section 08 80 00, using glazing method required to achieve performance criteria.

J. Structural Adhesive Glazing: Install glazing adhesive and weatherseal sealant in accordance with aluminum framing manufacturer's and adhesive manufacturer's instructions.

K. Coordinate with concealed door closers, exit signs, and fire alarm devices shown to be mounted directly to curtain wall or storefront mullions. Install associated conduit and junction boxes within curtain wall system.

3.03 ENTRANCE DOORS

A. Set thresholds in a bed of mastic and secure.

B. Install hardware using templates provided.
   1. See Section 08 71 00 for hardware installation requirements.

3.04 PERIMETER SEALING

A. Curtain Wall: Provide a continuous seal around the entire perimeter of each assembly at each of the following locations:
   1. Weather-Resistant Barrier:
      a. Glaze precured silicone sheet into glazing pocket of aluminum framing, seal silicone sheet to adjacent construction with gunnable sealant.
      b. Where indicated on the Drawings: Where configuration does not permit the use of precured sheet, place backer rod and seal between aluminum framing and adjacent weather-resistant barrier with a bead of Edge Seal.
   2. Air Seal and Back Dam: Seal the interior of each assembly to the weather-resistant membrane.
      a. For liquid-applied weather-resistant barrier, place backer rod and seal the aluminum framing to the weather-resistant membrane (or transition sheet) with a bead of Air Seal.

B. Weather Seal: Place backer rod and seal between aluminum framing and adjacent cladding using high movement silicone sealant specified in Section 07 92 00.

3.05 ERECTION TOLERANCES

A. Curtainwall Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 0.5 inches per 100 ft (12 mm/30 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Sealant Space Between Aluminum Framing and Adjacent Construction: 1/2 +/- 1/8 inch (13 +/- 3 mm), unless indicated otherwise on the drawings.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and inspection.

B. See Section 01 91 25 - Building Enclosure Commissioning for additional requirements.

C. Test installed aluminum framing for water leakage in accordance with AAMA 501.2.

D. Test installed thermally broken aluminum curtain wall framing for air leakage at 1.5 times the rate specified for laboratory testing in "Performance Requirements" article, but not more than 0.50 cfm/sq. ft. of fixed wall area, when tested in accordance with ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.

1. Test Area: A minimum of three areas at least 250 square feet in area to be selected by Architect based on Contractor’s sequencing of work. For any area which does not pass test, area shall be corrected and retested, and an additional two areas are to be tested.

E. Test installed aluminum framing and glazing assemblies for compliance with performance requirements for water penetration, in accordance with ASTM E1105, and as follows.

1. Arrange the test apparatus so as to test not only the aluminum framing and glazing assembly, but also to test the seal between it and the adjacent weather barrier (such as dampproofing on masonry, weather barrier on sheathing, etc.). Perform testing prior to installation of cladding (such as brick, siding, panels, etc.).
2. Perform testing at a uniform pressure equal to the framing manufacturer's published laboratory test value for water penetration. No provision of any industry guideline shall be effective to reduce the required field test pressure from the manufacturer's published laboratory test value.
3. Perform testing at a uniform pressure equal to the greater of 2/3's of the framing manufacturer's published laboratory test value for water penetration or 6.24 psf (300 Pa).
4. First establish an air pressure of 50% of the required value, hold for 5 minutes, and report any water leakage; then establish an air pressure of 75% of the required value, hold for 5 minutes, and report any water leakage; then establish the required air pressure and hold for 15 minutes and complete the test in accordance with ASTM E1105.
    a. Method A: Hold air pressure at 100% of the required value for 15 minutes, and report any water leakage.
5. In the event that the test of a unit fails, perform additional forensic water penetration testing on that same unit in accordance with AAMA 511 to identify and analyze the nature of the failure.

F. Test Frequency: Minimum one location per major elevation, as selected by Architect.

G. Repair or replace, as directed, components that have failed field testing, and then retest until performance is satisfactory. Test one additional location selected by Architect for each failed test.

3.07 ADJUSTING

A. Adjust doors for smooth operation, proper alignment, weather seal, and hardware function.

3.08 CLEANING AND PROTECTION

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

E. Protect finished work from damage.

END OF SECTION

SECTION 08 44 35 - PROTECTIVE FRAMED GLAZING ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior protective framed glazing assembly.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2021, with Errata (2022).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

D. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

G. UL (DIR) - Online Certifications Directory; Current Edition.

H. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors, if any.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

C. Samples: Submit samples as follows illustrating each exposed metal finish of interior and exterior project-specific applications.
   1. For color anodized aluminum, submit minimum of three samples illustrating expected range of color in actual production.

D. Design Data: Submit framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. Correct defective Work within a five year period after Date of Final Acceptance.

PART 2 PRODUCTS

2.01 INTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

A. Manufacturers:
   1. SAFTIFIRST, a division of O'Keeffe's Inc; GPX Architectural Series with fire resistive doors: www.safti.com.
   2. Technical Glass Products; Fireframes Curtainwall Series with Fireframes Designer Series doors: www.fireglass.com.
   3. Vetrotech North America; VDS 60 with VDS Doors: www.vetrotechusa.com.

B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.
   1. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

C. Structural Performance: Design to support dead loads and horizontal live loads equivalent to the following; coordinate connection to main structural members.
   1. Design Live Loads: Comply with requirements of North Carolina Building code.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths or 3/4 inch (19 mm), whichever is less, under specified design load.

D. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with ASTM E119 or UL 263 and requirements of local authorities having jurisdiction.
   1. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.

2.02 COMPONENTS

A. Framing Members: Formed steel structural members with aluminum cladding and non-combustible thermally-resistive material as required for fire rating.
   1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   2. Glazing Stops: Flush.
   3. Cross-Section: As indicated on drawings.
   4. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Firestopping: See Section 07 84 00.

C. Sealants Within Fire-Rated Assembly: As required by fire-rating and manufacturer's assembly.

D. Sealants: See Section 07 92 00 for additional information.

2.04 DOORS AND HARDWARE

A. Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches (44.5 mm).
   2. Top Rail: 4 inches (102 mm) wide.
   3. Vertical Stiles: 4-1/2 inches (114.3 mm) wide.
   4. Bottom Rail: 10 inches (254 mm) wide.
   5. Glazing Stops: Square.
   6. Finish: Same as framing.

B. Door Hardware:
   1. Types: See Section 08 71 00.
   2. Finish on Hand-Contacted Items: Brushed stainless steel.

2.05 FINISHES

A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.

B. Aluminum Finish: High performance organic coatings.
   1. Apply factory finish to surfaces that will be exposed in completed assemblies.

2. Touch-up surfaces cut during fabrication so that no natural aluminum metal surfaces are visible in completed assemblies, including joint edges.
3. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

C. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

D. Color: As selected by Architect from manufacturer's custom range.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.

B. Install framed glazing assemblies in accordance with NFPA 80 and requirements of local authorities having jurisdiction.

C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

D. Provide alignment attachments and shims to permanently fasten system to building structure.

E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

F. Provide thermal isolation where components penetrate or disrupt building insulation.

G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

H. Install door hardware using templates provided.
1. See Section 08 71 00 for hardware installation requirements.

I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.02 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch every 3 feet (1.6 mm every 0.914 m) non-cumulative or 1/2 inch per 100 ft (12.7 mm per 30.5 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6.4 mm).

3.03 ADJUSTING

A. Adjust doors for smooth operation.

END OF SECTION

SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Door hardware for wood doors, steel doors, aluminum framed entrance doors, all glass entrance doors, and miscellaneous hardware items.

B. Provide hardware not described herein but otherwise required for proper completion of the project, conforming to size, function, quality, and finish of other specified hardware.

1.02 REFERENCED STANDARDS

A. American National Standards Institute (ANSI):
   1. ANSI A117.1 Accessible and Usable Buildings and Facilities

B. Builders Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.1 Butts and Hinges.
   2. ANSI/BHMA A156.2 Bored and Preassembled Locks and Latches.
   3. ANSI/BHMA A156.3 Exit Devices.
   4. ANSI/BHMA A156.4 Door Controls - Closers.
   5. ANSI/BHMA A156.5 Auxiliary Locks and Associated Products.
   6. ANSI/BHMA A156.6 Architectural Door Trim.
   7. ANSI/BHMA A156.7 Template Hinge Dimensions.
   8. ANSI/BHMA A156.8 Door Controls - Overhead Stops and Holders.
   9. ANSI/BHMA A156.10 Power Operated Pedestrian Doors.
   10. ANSI/BHMA A156.13 Mortise Locks and Latches.
   11. ANSI/BHMA A156.14 Sliding and Folding Door Hardware.
   12. ANSI/BHMA A156.15 Release Devices: Closer Holders, Electromagnetic and Electromechanical.
   13. ANSI/BHMA A156.16 Auxiliary Hardware.
   14. ANSI/BHMA A156.17 Self-Closing Hinges and Pivots.
   15. ANSI/BHMA A156.18 Materials & Finishes.
   16. ANSI/BHMA A156.19 Power Assist & Low Energy Power Operated Doors.
   17. ANSI/BHMA A156.21 Thresholds.
   18. ANSI/BHMA A156.22 Door Gasketing and Edge Seal Systems.
   19. ANSI/BHMA A156.23 Electromagnetic Locks.
   20. ANSI/BHMA A156.24 Delayed Egress Locks.
   21. ANSI/BHMA A156.25 Electrified Locking Devices.
   22. ANSI/BHMA A156.26 Continuous Hinges.
   23. ANSI/BHMA A156.28 Recommended Practices for Mechanical Keying Systems.
   24. ANSI/BHMA A156.29 Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit.
   25. ANSI/BHMA A156.30 High Security Cylinders.
   26. ANSI/BHMA A156.31 Electrified Strikes and Frame Mounted Activators.
   27. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors with Steel Frames.
   28. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames.

C. Door and Hardware Institute (DHI):
   1. ANSI/DHI A115.IG Installation Guide for Doors and Hardware
   2. DHI Keying Systems and Nomenclature
   3. DHI Sequence and Format for the Hardware Schedule

D. International Building Code (IBC)

E. International Building Code as adopted by the State – Latest Edition

F. National Fire Protection Association (NFPA):
   1. NFPA 80 Fire Doors and Fire Windows

2. NFPA 252 Fire Tests of Door Assemblies

G. Underwriters Laboratories Inc. (UL):
1. UL 10C Positive Pressure Fire Tests Of Door Assemblies
2. UL 305 Panic Hardware
3. UL 437 Drill and Pick Resistant Key Cylinders
4. UL 1034 Burglary-Resistant Electric Locking Mechanisms

1.03 SUBMITTALS

A. Products other than those designated herein must be approved as substitutions prior to submittal of Door Hardware.

B. Door Hardware Schedule: Vertical format conforming to DHI “Sequence and Format for the Hardware Schedule.” Horizontal format schedules will be rejected without review. Format shall be 8-1/2 by 11 inch page size. Organize Schedule into headings, grouping doors to receive same hardware items, indicating quantity and complete designations of every item required for each door opening.

C. Schedule shall be submitted in searchable digital file format.

D. The schedule shall include:
1. Cover sheet indicating name and location of Project; name of Architect; name of Contractor; name, address and phone of hardware supplier, name of hardware consultant preparing the schedule; date of submittal or revised submittal.
2. A list of abbreviations used in schedule.
3. An index of door openings, listed in numerical order, with hardware heading identification cross-referenced to Architect’s set identification.
4. Hardware headings shall be listed in numerical order corresponding, as closely as possible, with numerical order of Architect's set numbers.
5. Each hardware heading shall have each door listed in numerical order according to door numbers in the Architect's door schedule, and denoting: location, configuration (single, pair, etc.), type (elevation, etc.), door and frame size(s), door and frame material(s), handing, fire rating, and key set identification.
6. Type, complete model number, style, function, size, hand, and finish of each door hardware item.
7. Manufacturer of each item.
8. Fastenings and other pertinent information.

E. Manufacturer's Technical Product Data / Catalog Cut Sheets: Clearly marked for each hardware item, including installation details, material descriptions, dimensions of individual components and profiles, and finishes. Format shall be 8-1/2 by 11 inch page size.

F. Wiring Diagrams: No later than 14 days after receipt of reviewed hardware schedule submittal, submit detailed wiring diagrams for power, signaling, monitoring, and control of the access control system electrified hardware or other system electrified components such as sensors, switches, or indicator/ strobe lights; identified by door number(s), and detailed specifically for each type and function of electrified door opening. Format shall be 8-1/2 by 11 inch page size. Include the following:
1. System Description of Operation. Include description of component functions including, but not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.
2. Elevation single-line diagram, showing interface between electrified door hardware and fire alarm, power, access control, and security systems as applicable.
3. Point-to-point wiring diagram for field-installed wiring.

G. Keying Schedule: In accordance with Owner's final keying instructions for locks. Conform to DHI “Keying Systems and Nomenclature.” Format shall be 8-1/2 by 11 inch page size.

H. Operation and Maintenance Data: Provide complete operating and maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.

I. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

J. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

B. Manufacturers, Hardware Supplier, and Installer shall have no less than five years' experience in the provision of Door Hardware for projects similar in size, complexity and type to this Project.

C. Hardware Schedule and Keying Schedule submittals shall be prepared by a Hardware Consultant holding the credentials of Architectural Hardware Consultant (AHC) issued by the Door and Hardware Institute. Hardware Consultant shall have no less than five years' experience in the scheduling of Door Hardware for projects similar in size, complexity and type to this Project; and shall be available, at no additional cost, during the course of the Work to consult with Contractor, Architect, and Owner regarding door hardware and keying.

1.05 REGULATORY REQUIREMENTS

A. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with all applicable regulations, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. At rated doors with panic exit devices, provide devices labeled as "Fire Exit Device."

B. Comply with all applicable accessibility regulations as set forth in Americans with Disabilities Act (ADA) -- Accessibility Guidelines for Buildings and Facilities (ADAAG) and ANSI A117.1. Standards for Accessible Design as applicable.

C. Latching and locking doors that are hand-activated and that are in a path of travel shall be operable with a single effort by lever-type hardware, panic bars, push-pull activating bars, or other hardware designed to be easy to grasp with one hand, not requiring tight grasping, tight pinching or twisting of the wrist; from egress side shall not require the use of a key, tool, or special knowledge for operation.
   1. All hand-activated hardware shall be mounted between 34 inches and 48 inches above finished floor.

D. At sliding and pocket doors, when fully open, operating hardware shall be exposed and usable from both sides.

E. Door closing devices shall comply with the following maximum opening-force requirements:
   1. Interior Hinged Doors: 5 lbf applied perpendicular to door at latch.
   2. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
   3. Fire Rated Doors: 5 lbf applied perpendicular to door at latch. To ensure latching, may be increased to the minimum force allowable by the appropriate administrative authority, not to exceed 15 lbf.

F. Thresholds shall be maximum 1/2 inch in height above floor and landing on both sides of openings. Bevel raised thresholds with a slope of not more than 1:2.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Each article of hardware shall be delivered individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule.

B. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

C. Hardware shall be stored in a dry, secure locked area, complete with shelving for unpacking and sorting of the door hardware.

D. Deliver all master keys by restricted, receipted delivery directly from the manufacturer to the Owner.

1.07 COORDINATION

A. Provide hardware templates to the parties involved for doors, frames, and other work specified to be factory prepared for door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. When required by door or frame fabricator, furnish physical samples of each mortised and recessed hardware item required.

C. Coordinate layout and installation of recessed pivots and closers with floor construction.

D. Electrical System Rough-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, and security system as applicable.

E. Pre-Installation Conference: Arrange conference at job site to coordinate door, frame, hardware and electronic security hardware installation; to be attended by the Architect, Owner, Contractor and representative personnel of firms involved in the provision and installation of said items.

F. Keying Conference: Arrange conference with Owner, or designated representative, and Manufacturer's/ Hardware Supplier's Architectural Hardware Consultant to establish keying requirements. Incorporate keying conference decisions into Keying Schedule.

1.08 WARRANTY

A. In addition to, and not precluding, other warranty requirements in the Contract Documents, the following hardware items shall carry extended minimum warranties as indicated:
   1. Hinges: Ten years from date of Substantial Completion.
   2. Locks: Five years from date of Substantial Completion.
   3. Exit Devices: Three years from date of Substantial Completion.
   4. Door Closers: Ten years from date of Substantial Completion.

1.09 MAINTENANCE

A. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements herein, provide products by one of the following manufacturers for each type of hardware:
   1. Butt Hinges: Stanley, Ives..
   2. Continuous Geared Hinges: Architectural Builders Hardware, Hager, National Guard Products, Pemko, Select.
   3. Cylinders and Keying: Per Owner's Requirements.
   4. Locksets and Latchsets: Schlage.
   5. Exit Devices: Von Duprin.
   6. Electric Strikes: Von Duprin.
   7. Electrical Power Transfers: Architectural Builders Hardware, Von Duprin.
   8. Flush Bolts and Door Coordinators: Architectural Builders Hardware, Ives, Rockwood, Trimco.
   9. Surface Door Closers: LCN 4040XP Series.
   10. Overhead Holders and Stops: Architectural Builders Hardware, Glynn-Johnson, Rixson.

11. Overhead Surface and Concealed Automatic / Low Energy Door Operators: Allegion LCN Senior Swing.
12. Automatic Door Actuators: Allegion, BEA, Besam, dormakaba, Horton, Motion Access, Stanley..
13. Bollards: BEA, Norton, Wikk.
14. Automatic Door Controls for Restrooms: Camden Door Controls.
15. Architectural Door Trim: Architectural Builders Hardware, Ives, Rockwood, Trimco.
16. Auxiliary Hardware: Ives, Rockwood, Trimco.
17. Door Bottoms, Metal Thresholds, Weatherstripping and Gaskets: National Guard Products, Pemko, Zero.
18. Key Storage System: Lund, MMF Industries, Telkee.

2.02 MATERIALS AND FABRICATION

A. Requirements for grade, materials, size, and other distinctive qualities of each type of door hardware are indicated herein. Furnish items in types, sizes or weight, in accordance with manufacturer's standards, appropriate for the conditions of installation and service, unless otherwise indicated.

B. Products named or identified by make or model number, or other designation and described herein are base products. Base products establish the standards of type, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

2.03 FASTENERS

A. Provide concealed fasteners for hardware items on exterior doors which are exposed when door is closed.

B. Combination machine screws and expansion shields shall be used for attaching hardware to concrete or masonry.

C. Fasteners exposed to the weather in the finished work shall be of brass, bronze, or stainless steel.

2.04 BUTT HINGES

A. Butt hinges shall meet the requirements of ANSI/BHMA A156.1.

B. Hinge dimensions shall meet the requirements of ANSI/BHMA A156.7.

C. Base Metal shall be steel plated for fire-rated doors; bronze or stainless steel for exterior out swinging doors; bronze or plated steel elsewhere as scheduled.

D. Provide hinges with antifriction bearings for doors with closers.

E. Unless otherwise indicated, provide hinges in heights and weights as follows:
   1. Doors to 36 inches wide: 4-1/2 inches Standard Weight.
   2. Doors over 36 inches to 48 inches wide: 5 inches Heavy Weight.
   3. Doors over 48 inches wide: 6 inches Heavy Weight.
   4. Doors over 1-3/4 inch thick shall be per hinge manufacturers published listings or recommendations.

F. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.

G. Number of hinges per leaf shall be as follows:
   1. Doors to 60 inches in height: 2 hinges.
   2. Doors over 60 to 90 inches in height: 3 hinges.
   3. Doors over 90 to 120 inches in height: 4 hinges.
   4. For doors over 120 inches in height: 4 hinges plus 1 hinge for every 30 inches, or fraction thereof, door height greater than 120 inches.

H. Screws: Flat head wood screws not less than 1-1/2 inches long for hinges for wood doors; flat head machine screws elsewhere.

I. Hinges for reverse bevel doors with key locks shall have pins that are made non-removable [NRP] when the door is in the closed position by means of a set screw in the hinge pin barrel. Where passage or privacy sets, push/pulls openings are specified, non-removable pins are not required.

J. Electrified hinges:
   1. Coordinate number and size of wires for electrified hardware served.
   2. Provide junction box/ mortar shield for each electrified hinge.

2.05 CONTINUOUS PINNED HINGES

A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.

B. Type: Pin and barrel construction; 1/4 inch diameter stainless steel pin; split nylon or stainless steel bearings. Fabricated from 14 gauge cold-rolled steel or 304 stainless steel as indicated.

C. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.

D. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

2.06 CONTINUOUS GEARED HINGES

A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.

B. Type: Heavy duty assembly of 3 interlocking aluminum extrusions. Door leaf and jamb leaf shall be continuously geared together the full hinge length; secured together with full length cover channel permitting 180 degree operation. Vertical door loads carried on integrated thrust bearings spaced no more than 3 inches apart.

C. Hinges shall have non-removable cap at hinge top to prevent foreign material from becoming lodged in hinge gear mechanism.

D. Unless otherwise noted, provide factory finished to match door and frame finish.

E. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

2.07 CYLINDERS, KEYING AND KEY STORAGE

A. Lock cylinders shall meet ANSI/BHMA A156.5 requirements.

B. Keying system shall meet ANSI/BHMA A156.28 requirements.

C. All cylinders shall be interchangeable core type and match Owner Standard..

D. Cylinders at exit devices shall be interchangeable core type. Provide mortise or rim type cylinders as required by device for all exit devices having key locking function.

E. Keying shall be provided per the Owner’s requirements.

F. Cylinders shall be keyed according to approved Keying Schedule.

G. Provide a temporary keying system for interim use during construction.

H. Provide change keys in individual envelopes for each cylinder delivered. Envelopes shall be marked with respective door identification numbers.

I. Key set symbol, and inscription "Do Not Duplicate" shall be stamped on all keys.

J. Key set symbol shall be concealed stamped on all cylinders/ removable/ Interchangeable cores.

K. Keys shall be supplied as follows:
   1. Locks: 2 change keys each lock.
   2. Master keyed sets: 2 keys each set.
   3. Grand master keys: 5 total.
   4. Great Grand master keys: 5 total.
   5. Interchangeable Core control keys: 2 total.
   6. Construction keys: 10 total.
   7. Blank keys: 100 total.

L. Provide Key Storage / Control System conforming to ANSI/BHMA A156.5, including key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish and key locking door.
    1. Key tags and holders shall be inscribed with key-change number and key-control to conform with approved hardware schedule for identification.
    2. Key Storage System shall be large enough to accommodate 150 percent of the facility.

M. Subject to compliance with requirements, provide emergency entrance key vault(s); Knox Company 3200 Series, or equal.
    1. Finish Color - Black, Dark Bronze or Aluminum as selected by Architect.
    2. Where indicated provide security key override switches for electrically activated openings.
    3. Coordinate and provide keying and type per fire/ police department, and other jurisdictional agency requirements.
    4. Refer to drawings for quantity and location.

2.08 LOCKSETS AND LATCHSETS

A. Mortise Locks and Latches shall meet ANSI/BHMA A156.13 Grade 1 requirements.

B. Auxiliary Locks shall meet ANSI/BHMA A156.5 requirements.

C. Electrified Locks shall also meet ANSI/BHMA A156.25 requirements.

D. Operating trim shall be lever type: Refer to hardware sets.

E. Lock functions which include thumb turn trim shall be provided with thumb turns compliant with accessibility code requirements.

F. Lock Throw: Comply with requirements for length of latch bolts to comply with labeled fire door requirements.

G. Lock backset shall be 2-3/4 inches unless otherwise indicated.

H. ADA Thumb-turns shall be used on all locksets requiring thumb-turns, similar to Accurate Lock and Hardware ADA Turn, Corbin Russwin Ergonomic or Schlage L583-363 EZ-Turn.

I. Electromechanical locksets utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door in positive latched position when power is off.

J. Narrow backset locksets to be used when standard width/ backset devices do not fit door stile.

2.09 EXIT DEVICES

A. Exit devices and exit device accessories shall meet ANSI/BHMA A156.3, Grade 1 requirements.

B. Electromechanical exit devices shall also meet ANSI/BHMA A156.25 requirements.

C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

D. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

E. Outside Trim: Design, material and finish to match locksets, unless otherwise indicated.

F. Adjustable strikes shall be provided for rim type and vertical rod devices.

G. Electromechanical exit devices utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door(s) in positive latched position when power is off.

H. Narrow backset devices shall be provided to match specified device when standard width chassis/ devices do not fit door stile.

I. Provide flush end caps at exit devices.

J. Provide device for proper door thickness.

K. Weatherized exit device:
   1. Areas where hardware is prone to corrosion provide powder coated metal finish.

2.10 ELECTRIC STRIKES

A. Electric strikes shall meet ANSI/BHMA A156.31 Grade 1 requirements, and be listed and labeled under UL 1034 Burglary Resistant Electric Locking Equipment.

B. Electric strikes for fire rated openings shall be listed and labeled for such use by a testing agency acceptable to authorities having jurisdiction. Fail Secure (fail locked) strikes shall be used at all fire rated openings.

2.11 FLUSH BOLTS

A. Automatic flush bolts shall meet ANSI/BHMA A156.3

B. Manual flush bolts shall meet BHMA A156.16 requirements.
   1. Bottom bolt shall have 12 inch long operating rod. Top bolt operating rod shall be determined by door height, assuring the operator is located less than 72 inches above the floor.
   2. Manual Flush Bolts are not to be utilized except where a pair of non-rated doors serving a room not normally occupied is needed for the movement of equipment.

C. Provide dust proof strikes for bottom bolts. Dust proof strikes shall meet BHMA A156.16.

2.12 DOOR COORDINATORS

A. Door coordinators shall meet ANSI/BHMA A156.3 requirements.

B. Door coordinators shall be flat bar type; stop mounted with all necessary filler bars and mounting brackets to accommodate required hardware.

C. Provide carry bar at each pair of doors equipped with an overlapping astragal, except when automatic or self-latching bolts are used.

2.13 SURFACE DOOR CLOSERS

A. Door closing devices shall meet ANSI/BHMA A156.4, Grade 1 requirements.

B. Surface closers shall be fully adjustable with sweep speed, latch speed and back check position valves.

C. Provide closers size adjusted in accordance with ANSI/BHMA A156.4; sized as required to insure closing and latching of doors.

D. Arm selection shall follow the requirements of the manufacturer's recommendations with brackets, drop plates and miscellaneous accessories provided as necessary.

E. Provide closers with arms designed to permit openings of doors as far as job conditions will permit; unless otherwise indicated closers with arms restricting opening of door will not be acceptable.

2.14 LOW ENERGY DOOR OPERATORS

A. Surface Applied Operator: The operator header shall be mounted to the surface of the door frame or wall. Connecting hardware shall be a double arm arrangement that can either push the door or pull the door open to suit the job condition. Provide parallel arm when operator mounting is on the pull side, and adjacent wall is within 4 inches of the door frame. Provide fire labeled unit for use at rated doors.

B. Low Energy Door Operators shall meet ANSI/BHMA A156.19 requirements.
   1. Provide safety sensors and features to meet A156.19 requirements and all applicable codes.

2. Door shall not open to back check faster than 3 seconds, and shall require no more than 15 lbf applied 1 inch from latch edge to stop door movement.
3. Door shall remain in fully open position for no less than 5 seconds.
4. Door shall close from 90 degrees to 10 degrees no faster than 3 seconds, and 10 degrees to fully close no faster than 1-1/2 seconds.
5. Power operation shall be activated by push plate switch, or other actuators as indicated.

C. Provide UL labeled operators at fire-rated openings. Provide power-disconnect interface to Fire Alarm; doors to be self closing and latching, in full compliance with Code requirements for “Fire Assembly, Self Closing” doors.

D. Provide UL labeled operators at smoke barrier openings. Provide hold-open circuitry and power-disconnect interface to Fire Alarm; doors to be automatic closing and latching, in full compliance with Code requirements for “Fire Assembly, Automatic Closing” doors.

E. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

F. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

2.15 AUTOMATIC DOOR ACTUATORS

A. Provide as a standard, one at each side of automated entrance. Refer to hardware sets for type.

2.16 ARCHITECTURAL DOOR TRIM

A. Architectural door trim shall meet ANSI/BHMA A156.6 requirements.

B. Door Protection Plates: Kick, mop, and armor plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be provided with countersunk mounting holes and No. 6 oval head screw fasteners. Width of kick and armor plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Width of mop plates shall be 1 inch less than door width.

C. Kick Plates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

D. Mop Plates: Provide with four beveled edges ANSI J103, 4 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

E. Provide cutouts for hardware as listed in the hardware sets.

F. Door Edging and Astragals: Fabricated from 18 gauge cold-rolled steel or 304 stainless steel as indicated; factory prepared for all mortise hardware; countersunk screw mounting.

G. At fire rated doors, provide UL labeled edge protection in sizes, types, fasteners and materials only in accordance with door manufacturer’s listings for respective ratings.

H. Push and pull plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be furnished with countersunk mounting holes and No. 6 oval head screw fasteners. Pull plates shall also be furnished with flat-head through bolts for pull grip.

I. Push and pull bars and grip handles shall be brass, bronze, or stainless steel depending on BHMA finish indicated.

2.17 AUXILIARY HARDWARE

A. Auxiliary hardware shall meet ANSI/BHMA A156.16 requirements.

B. Door Stops: Provide floor stop or wall bumper. Where it is not possible to properly place a floor or wall type stop, provide heavy duty concealed/surface overhead type stop, or when door closer is indicated on the push side of the door, provide heavy-duty dead stop function in closer.

1. Stops shall be of heavy duty construction..
   a. Wall bumpers shall have no visible fasteners.
   b. Floor stops shall be of height required by floor conditions.
2. Overhead Stops
   a. Overhead holders and stops shall meet ANSI/BHMA A156.8 requirements.
   b. Overhead door holders and stops shall be adjustable from 90 to 110 degrees dead stop or hold open position, as applicable.
   c. Overhead door stops shall have shock absorbers providing 5 to 7 degrees compression before dead stop.
   d. Overhead stops shall not be provided with hold open function when used at fire rated doors.
   e. Overhead stop to work with closer.

C. Silencers: Rubber, non-marring configured for metal or wood frames as scheduled. Provide quantity based on door size.

2.18 ELECTRICAL POWER TRANSFERS

A. Electrical power transfers shall be capable of transferring sufficient electrical current to properly operate electrified hardware in door.

B. Electrical power transfers used on fire rated doors shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

C. Verify and provide at all doors with Pivots.

D. At frames that are 1.5” or less or doors with swing clear hinges, provide Securitron EPT or ABH PT1000SC power transfer.

E. Provide with Molex or quick connector.

F. Power over Ethernet transfer shall incorporate pin connector to match locking device.

2.19 ELECTRIFIED ACCESSORIES

A. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
   1. Provide one each of the following tools as part of the base bid contract:
      a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
      b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
   2. Manufacturers:
      a. Hager Companies (HA) - Quick Connect.
      b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
      c. Allegion CON.
      d. dormakaba

2.20 DOOR BOTTOMS

A. Door bottoms shall be of aluminum or extruded bronze of the type and finish indicated and shall provide proper clearance and an effective seal with specified thresholds.

B. Door bottom shall have a vinyl, neoprene, silicone rubber, polyurethane or brush seal as indicated.

C. The door bottom shall exclude light when the door is in the closed position and shall inhibit the flow of air through the unit.

D. Concealed automatic door bottoms must extend the full width of the door. If door requiring concealed door bottom has conflicting concealed hardware provide narrow mortised door bottoms similar to Pemko US-FHRD.

2.21 METAL THRESHOLDS

A. Thresholds shall meet ANSI/BHMA A156.21 requirements.

B. Thresholds shall be heavy-gauge aluminum or bronze of the configuration and finish indicated, and shall provide an effective seal with door bottom.

C. Where required, thresholds shall be prepared to accommodate floor closers, pivots, and projecting bolts of latching hardware.

D. Thresholds at floor closers shall have mitered returns and removable access portion for floor closer maintenance.

E. Provide thresholds at doors where indicated in hardware sets. Additionally, where combustible flooring passes under doors, provide fire door thresholds in accordance with applicable regulatory requirements.

2.22 METAL HOUSED TYPE WEATHERSTRIP

A. Metal Housed Type Weatherstrip shall meet ANSI/BHMA A156.22 requirements.

B. Metal Housed Type Weatherstrip shall be aluminum or bronze of the type and finish indicated, comprised of metal retainers with vinyl, neoprene, silicone rubber, polyurethane or brush inserts as indicated.

2.23 GASKETING

A. Gasketing shall meet ANSI/BHMA A156.22 requirements.

B. Shall be a compression type product for use with wood or steel doors; labeled for use on smoke-control and fire-rated doors where required.

2.24 FINISHES

A. Provide hardware in finishes as indicated in hardware set or as noted below:

B. Exterior Hardware Finish to be 630.

C. Interior Core hardware finish to be 626.

D. Interior Fit out hardware finish to be 626.

E. Finish for Thresholds and Surface Door Bottoms shall be Aluminum.

F. Closers shall be Powder Coated 689 or Metal Cover

G. Adhesive Gasketing shall be Black.

H. Areas where hardware may be prone to corrosion, 32D-316 metal finish or Clear Powder Coat Finish.

I. Interior and Exterior Aluminum Framed Openings: Finish to be selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine rough-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Steel doors shall be factory prepared for hardware per ANSI/BHMA A156.115.

B. Wood doors shall be factory prepared for hardware per ANSI/BHMA A156.115W.

C. Installation shall be in accordance with DHI A115.IG.

D. Hardware for fire door assemblies shall be installed conforming with NFPA 80, and all other applicable building codes and regulations.

E. Hardware for smoke door assemblies shall be installed conforming with NFPA 105, and all other applicable building codes and regulations.

F. Install each door hardware item according to manufacturer's printed instructions, utilizing templates and proper fasteners provided by manufacturer.

G. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

H. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in other Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

I. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

J. All wall stops shall be installed with reinforced blocking in wallboard construction. Drywall anchors are not an acceptable means of reinforcement/blocking. Provide intermediate steel plates or channel reinforcement backing at wall stops mounted in wallboard construction.

K. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's representative, permanent key all lock cylinders. Record and file all keys in the key control system specified, and turn system over to Owner for sole possession and control.

L. Key control storage system shall be installed where directed by the Owner.

M. Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches; with a minimum of 1 inch thread engagement into the floor or anchoring device used. Thresholds over 6 inches in width shall be secured with a double row of fasteners.

N. Exterior thresholds shall be installed in a bed of sealant with combination expansion anchors and stainless steel machine screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws.

3.03 CONTINUOUS HINGES

A. Prevent conflicts with other installed hardware mounted in the same location.

B. Coordinate continuous hinge lengths to prevent conflicts with other door hardware such as door sweeps and door bottoms. Door bottoms shall be installed full width of door to create a full seal.

3.04 DOOR CLOSING DEVICES

A. Surface closers on doors opening to or from halls and corridors shall be mounted on the room side of the door.

B. Surface closers on doors opening into stairs or stair vestibules shall be mounted on the stair or stair vestibule side of the door.

C. Surface closers on exterior doors shall be mounted on the interior side of building utilizing regular arm, or parallel arm mounting as required.

D. Door closing devices with adjustable spring power shall be adjusted for proper door operation, and compliance with all applicable codes and regulations.

E. Cutting of gasketing or weatherstripping to accommodate closer installation is not acceptable.

3.05 PUSH-PULL PLATES

A. Pull plate grip handles shall be through bolted through the door. When push plate is indicated on opposite door side, through bolts shall be countersunk with push plate mounted to conceal through bolts.

3.06 KEY CONTROL STORAGE SYSTEMS

A. Key control storage system shall be installed where directed by the Architect.

B. Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

3.07 GASKETING/ WEATHERSTRIPPING

A. Prevent conflicts with other installed hardware mounted in the same location.

B. Coordinate door sweep and door bottom widths to prevent conflicts with other door hardware such as continuous hinges. Door bottoms shall be installed full width of door to create a full seal.

3.08 ASTRAGALS

A. Unless otherwise indicated install overlapping astragals as follows:
   1. At out-swing pairs of doors, mount astragal on active leaf.
   2. At in-swing pairs of doors, mount astragal on inactive leaf.

3.09 HARDWARE LOCATIONS

A. Unless otherwise indicated install hardware as follows or as local codes require:
   1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.
   2. Top Hinge: 5 inches from door top to top of hinge.
   3. Center Hinge(s) or Pivot(s): Spaced equidistantly between top and bottom hinges/ pivots.
   4. Lockset / Latchset: 38 inches from finished floor to center of lever.
   5. Hospital Push-Pull Latchset/ Lockset: 42 inches from finished floor to center of latch.
   6. Exit Device: 38 inches from finished floor to device centerline.
   7. Deadlock: 42 inches from finished floor to center key cylinder / thumb turn.
   8. Push Plate/ Pull Plate: 42 inches from finished floor to center of pull.
   9. Wall Bumper: Centered at point on wall where lever, or other operating trim, first makes contact with wall.

10. Floor Stop: Adjacent to wall; not to exceed 4 inches from face of wall; located 3 inches from latch edge of door; in any case never more than 50 percent of door width from latch edge of door.

3.10 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended.

B. Engage a factory-authorized service representative to adjust door closing devices, compensating for final operation of heating and ventilating equipment, and to comply with referenced accessibility requirements.

C. Follow-up Adjustment: Approximately 6 months after date of Final Acceptance, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of door hardware.
   2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

D. Where door closers are provided, adjust sweep speed so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

3.11 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant:
   1. Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   2. Independent Architectural Hardware Consultant shall inspect door hardware and prepare written report whether installed work complies with or deviates from requirements, whether door hardware is properly installed and adjusted, and prepare a specific list of any deficiencies, a copy of which shall be provided to Architect.
   3. Contractor shall correct all deficiencies noted in above report.
   4. Independent Architectural Hardware Consultant shall re-inspect door hardware and prepare a report certifying correction of deficiencies and compliance with requirements.

3.12 COMPLETION

A. When complete all hardware shall be properly secured in place and all exposed surfaces shall be clean and free from scratches, paint, and other defects and damages.

B. Contractor shall demonstrate that all keys properly operate the locks as identified in the approved Keying Schedule.

3.13 DOOR HARDWARE SETS

A. The following is a general listing of hardware requirements. Provide hardware items required by established standards and practices to meet state and local codes, whether or not specifically indicated in the following sets.

B. Silencers and gasketing, where listed in Hardware Sets, may be omitted at openings where door frames are provided with integral seals if integral seals satisfy all applicable Codes and Regulations.

C. Refer to Door Schedule and/ or Drawings for door opening information, hardware set assignment, and related requirements.

D. Door contacts where indicated on security drawings.

E. Access Control Reader where indicated on security drawings.

Hardware Sets

Set: 1.0

Description: Paired Opening - Main Entry, Access controlled, Operator

2 Continuous Hinge	FMHD1 x EPT Prep	Pemko
2 Electric Power Transfer	EPT10	Von Duprin
1 Mullion	Aluminum x 154 Mullion Stabilizers	Von Duprin
1 Rim Exit, QEL, RX, Cylinder	.QEL .RX .LD 99.NL-OP .CON .110MD-NL (Provide narrow stile as required)	Von Duprin
1 Rim Exit Device, QEL, RX	.QEL .RX .LD 99.EO .CON (Provide narrow stile as required)	Von Duprin
Cylinder / Core where required	To Suit Device	Schlage
Cylinder Housing	To Suit Mullion	Schlage
1 Offset Door Pull	8190HD-18	Ives
1 Door Closer	4040XP SCUSH	LCN
1 Automatic Operator	Senior Swing	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S or by door/frame manufacturer	NGP
2 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP
2 Door/Frame Harness		
2 Door Position Switch	By Security Vendor	1
2 Automatic Operator Actuators	As selected by Architect or 10PBSJ1	BEA
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Provide Wikk Bollard SQ14 at door 100B

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 2.0

Description: Paired Opening - Exterior, Access Controlled

2 Continuous Hinge	FMHD1 x EPT Prep	Pemko
2 Electric Power Transfer	EPT10	Von Duprin
1 Mullion	Aluminum x 154 Mullion Stabilizers	Von Duprin
2 Rim Exit, QEL, RX, Cylinder	.QEL .RX .LD 99.NL-OP .CON .110MD-NL (Provide narrow stile as required)	Von Duprin
Cylinder / Core where required	To Suit Device	Schlage
Cylinder Housing	To Suit Mullion	Schlage
1 Offset Door Pull	8190HD-18	Ives
2 Door Closer	4040XP SCUSH	LCN
1 Threshold	½" High (425HD)	NGP
1 Meeting Stile Astragal	160SA	NGP
1 Gasketing	700ES x 700S or by door/frame manufacturer	NGP
1 Overhead Rain Drip	16A	NGP
1 Mullion Gasketing	5100N	NGP
2 Door Bottom	335N (wood) 320N (metal) or by door/frame manufacturer	NGP
2 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 3.0

Description: Paired Opening - Interior Vestibule, Operator

2 Continuous Hinge	FMHD1	Pemko
2 Touch Bar	350	Von Duprin
2 Offset Door Pull	8190HD-18	Ives
1 Door Closer	4040XP SCUSH	LCN
1 Automatic Operator	Senior Swing	LCN
1 Gasketing	700ES x 700S or by door/frame manufacturer	NGP
2 Automatic Operator Actuators	As selected by Architect or 10PBSJ1	BEA

Set: 4.0

Description: Paired Opening - Interior Vestibule

2 Continuous Hinge	FMHD1	Pemko
2 Touch Bar	350	Von Duprin
2 Offset Door Pull	8190HD-18	Ives
2 Door Closer	4040XP SCUSH	LCN
1 Meeting Stile Astragal	160SA	NGP
1 Gasketing	700ES x 700S	NGP
2 Sweep	197NA	NGP

Set: 5.0

Description: Single Opening - Exterior, Access Controlled, Operator

1 Continuous Hinge	FMHD1 x EPT Prep	Pemko
1 Electric Power Transfer	EPT10	Von Duprin
1 Rim Exit, QEL, RX, Cylinder	.QEL .RX .LD 99.NL-OP .CON .110MD-NL (Provide narrow stile as required)	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Offset Door Pull	8190HD-18	Ives
1 Automatic Operator	Senior Swing	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S	NGP
1 Door Sweep with Drip Cap	C627A	NGP
1 Door/Frame Harness		
2 Automatic Operator Actuators	As selected by Architect or 10PBSJ1	BEA
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 6.0

Description: Single Opening - Exterior, Access Controlled

1 Continuous Hinge	FMHD1 x EPT Prep	Pemko
1 Electric Power Transfer	EPT10	Von Duprin
1 Rim Exit, QEL, RX, Cylinder	.QEL .RX .LD 99.NL-OP .CON .110MD-NL (Provide narrow stile as required)	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Offset Door Pull	8190HD-18	Ives
1 Door Closer	4040XP SCUSH	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S or by door/frame manufacturer	NGP
1 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP
1 Door/Frame Harness		
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

Set: 7.0

Description: Single Opening - Roof Patio, Auto Operator

1 Continuous Hinge	FMHD1 x EPT Prep	Pemko
1 Continuous Hinge	FMHD1	Pemko
1 Electric Power Transfer	EPT10	Von Duprin
1 Rim Exit, QEL, RX, Cylinder	.QEL .RX .LD 99.NL-OP .CON .110MD-NL (Provide narrow stile as required)	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Offset Door Pull	8190HD-18	Ives
1 Automatic Operator	Senior Swing	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S	NGP
1 Door Bottom	335N (wood) 320N (metal) or by door/frame manufacturer	NGP
1 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP
1 Door/Frame Harness		
2 Automatic Operator Actuators	As selected by Architect or 10PBSJ1	BEA
1 Door Position Switch	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Set: 8.0

Description: Single Opening - Roof Patio

1 Continuous Hinge	FMHD1	Pemko
1 Exit Only	LD.99.EO	Von Duprin
1 Surface Closer	4040XP Reg/EDA	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S or by door/frame manufacturer	NGP
1 Door Bottom	335N (wood) 320N (metal) or by door/frame manufacturer	NGP
1 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP
1 Door Position Switch	By Security Vendor	

Set: 9.0

Description: Paired Opening - Exterior, Access Controlled

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
2 Flush Bolt	555	Rockwood
1 Dust Proof Strike	570	Rockwood
1 Electrified Mortise Lock - Fail Secure	RX L9092 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Concealed Overhead Stop	1020 Series	ABH
1 Door Closer	4040XP SCUSH	LCN
1 Threshold	½" High or 425HD	NGP
2 Meeting Stile Astragal	160SA	NGP
1 Gasketing	700ES x 700S	NGP
1 Overhead Rain Drip	16A	NGP
2 Door Sweep with Drip Cap	C627A	NGP
1 Door/Frame Harness		
2 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

Set: 10.0

Description: Paired Opening - Roof Mechanical

Hinge, Full Mortise	5BB1 [HW]	Ives
2 Flush Bolt	555	Rockwood
1 Dust Proof Strike	570	Rockwood
1 Storeroom/Closet Lock	L9080 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Door Closer	4040XP SCUSH	LCN
1 Meeting Stile Astragal	160SA	NGP
1 Gasketing	700ES x 700S	NGP
1 Overhead Rain Drip	16A	NGP
2 Door Sweep with Drip Cap	C627A	NGP

Notes: Key on exterior side

Set: 11.0

Description: Paired Opening - Roof Mechanical

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Storeroom/Closet Lock	L9080 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Door Closer	4040XP SCUSH	LCN
1 Gasketing	700ES x 700S	NGP
1 Overhead Rain Drip	16A	NGP
1 Door Sweep with Drip Cap	C627A	NGP

Notes: Key on exterior side

Set: 12.0

Description: Single Opening - Exterior, Access Controlled, Panic

1 Continuous Hinge	FMHD1 x EPT Prep	Pemko
1 Electric Power Transfer	EPT10	Von Duprin
1 Fail Secure Rim Exit	.RX LD 99 L[F] FS/FSE E 996L(Std)	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Door Closer	4040XP SCUSH	LCN
1 Gasketing	5050 Adhesive	NGP
1 Door Bottom	335N (wood) 320N (metal)	NGP
1 Door Sweep	678A	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

At electrical rooms, doors need to swing out. Please confirm all doors in this set swing out of room.

Set: 13.0

Description: Single Opening - Electrical, Access Controlled

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Fail Secure Rim Exit	.RX LD 99 L[F] FS/FSE E 996L(Std)	Von Duprin
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 14.0

Description: Single Opening - Access Controlled

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Fail Secure Rim Exit	.RX LD 99 L[F] FSE E 996L(Std)	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Door Closer	4040XP SCUSH	LCN
1 Gasketing	5050 Adhesive	NGP
1 Door Bottom	335N (wood) 320N (metal)	NGP
1 Door Sweep	678A	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to become unlocked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

Set: 15.0

Description: Single Opening - Exterior, Access Controlled

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electrified Mortise Lock - Fail Secure	RX L9092 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Concealed Overhead Stop	1020 Series	ABH
1 Surface Closer	4040XP Reg/EDA	LCN
1 Threshold	½" High or 425HD	NGP
1 Gasketing	700ES x 700S	NGP
1 Overhead Rain Drip	16A	NGP
1 Door Bottom	335N (wood) 320N (metal) or by door/frame manufacturer	NGP
1 Door Sweep with Drip Cap	C627A or by door/frame manufacturer	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Key at interior side on door 404
Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 16.0

Description: Paired Opening - Access controlled, Unclassified Corridor

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Constant Latching Flush Bolt	2845/ 2945(as required)	Rockwood
1 Dust Proof Strike	570	Rockwood
1 Mortise Exit Device	QEL RX 9875.L .996L(Std) [F] Mod SD	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Coordinator x Filler Bar x Brackets	2600 Series (Cutouts as Required)	Rockwood
2 Surface Closer	4040XP Reg/EDA	LCN
2 Stop	Refer to Part 2	Rockwood
1 Threshold	½" High or 425HD	NGP
1 Gasketing	5050 Adhesive	NGP
2 Sweep	197NA	NGP
1 Door/Frame Harness		
2 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

Set: 17.0

Description: Single Opening - Service Corridor

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Electrified Mortise Lock - Fail Secure	RX L9092 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position switch, where indicated by security, to monitor status of door.

Set: 18.0

Description: Paired Opening - Classroom Pair

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Constant Latching Flush Bolt	2845/ 2945(as required)	Rockwood
1 Dust Proof Strike	570	Rockwood
1 Lock with thumbturn x Occupancy Indicator	L9050 03A x L283-711 x L283-722	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Coordinator x Filler Bar x Brackets	2600 Series (Cutouts as Required)	Rockwood
2 Surface Closer	4040XP Reg/EDA (4041DEL @ labs)	LCN
2 Kick Plate	K1050 x 10" High x CSK x 4BE	Rockwood
2 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
2 Silencer	MSM01	Rockwood

Set: 19.0

Description: Paired Opening - Storeroom

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Flush Bolt	555	Rockwood
1 Dust Proof Strike	570	Rockwood
1 Storeroom/Closet Lock	L9080 03A	Schlage
Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA (4041DEL @ labs)	LCN
2 Kick Plate	K1050 x 10" High x CSK x 4BE	Rockwood
2 Stop	Refer to Part 2	Rockwood
2 Silencer	MSM01	Rockwood

Set: 20.0

Description: Single Opening - Exit Only

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Rim Exit Device, Key Only	99.NL-OP [F] x Mod SD	Von Duprin
1 Surface Closer	4041DEL @ labs	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
Silencer	MSM01	Rockwood

Set: 21.0

Description: Single Opening - Stairwell

Hinge, Full Mortise	5BB1 HW	Ives
1 Rim Exit Device, Passage	99L-BE [F] 996L-BE [35 Series where required]	Von Duprin
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP

Notes: At fire rated doors, hardware shall be provided by fire rated aluminum door manufacturer
Provide CUSH arm per conditions

Set: 22.0

Description: Single Opening - Electrical

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Rim Exit Device, Storeroom	99L-NL [F] 996L-NL [35 Series where required]	Von Duprin
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP

Set: 23.0

Description: Single Opening - Classroom - Keyed both sides

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Store/Utility Room Lock - Keyed Both Sides	L9466 .03A x Occupancy Indicator	Schlage
2 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP

Set: 24.0

Description: Single Opening - Access Controlled, MDF/IDF

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Electrified Mortise Lock - Fail Secure	RX L9092 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
1 Sweep	197NA	NGP
1 Door/Frame Harness		
1 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Access Control reader where indicated by security
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses
* Door Position Switch, where indicated by security, to monitor status of door.

Set: 25.0

Description: Single Opening - Classroom

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Lock with thumbturn x Occupancy Indicator	L9050 03A x L283-711 x L283-722	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
Silencer	MSM01	Rockwood

Set: 26.0

Description: Single Opening - Classroom, Closer

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Lock with thumbturn x Occupancy Indicator	L9050 03A x L283-711 x L283-722	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
Silencer	MSM01	Rockwood

Set: 27.0

Description: Single Opening - Storeroom

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Storeroom/Closet Lock	L9080 03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
3 Silencer	MSM01	Rockwood

Notes: Provide gasketing at rated doors only
Closer not required at doors 160B, 311, 330A,

Set: 28.0

Description: Single Opening - Exit Lock

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Exit Lock	L9025 .03A	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
Silencer	MSM01	Rockwood

Notes: no trim on BIO side of door

Set: 29.0

Description: Single Opening - Corridor

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Passage Latch	L9010 03A	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
Silencer	MSM01	Rockwood

Set: 30.0

Description: Single Opening - Interlock

Hinge, Full Mortise	5BB1 [HW]	Ives
1 Electric Power Transfer	EPT10	Von Duprin
1 Classroom, RX	RX L9070 03A	Schlage
1 Magnetic Lock	M680EBDX	Securitron
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP
1 Relay Board	RB-4-24	Securitron
1 Door Position Switch	By Security Vendor	
1 Power Supply	By Security Vendor	
1 Wiring Diagrams	Elevation & Point to Point Wiring Diagrams by Hardware Distributor	

Notes: Safety interlock. Door (x.1) will remain locked until other door (x.2) is closed and vice versa. Both doors will be unlocked in event of fire alarm or power failure.

Set: 31.0

Description: Single Opening - Privacy

Hinge, Full Mortise	5BB1	Ives
1 Privacy Lock	L9044 03A x 09-509 x L583-363 x L283-711 x L283-722	Schlage
1 Surface Closer	4040XP Reg/EDA	LCN
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP

Set: 32.0

Description: Single Opening - Office

Hinge, Full Mortise	5BB1	Ives
1 Lock with thumbturn x Occupancy Indicator	L9050 03A x L283-711 x L283-722	Schlage
1 Cylinder / Core where required	To Suit Device	Schlage
1 Stop	Refer to Part 2	Rockwood
Silencer	MSM01	Rockwood

Set: 33.0

Description: Single Opening - Multi-Stall Toilets

Hinge, Full Mortise	5BB1	Ives
1 Push Plate	70G PUSH	Rockwood
1 Pull Plate	110x70C	Rockwood
1 Surface Closer	4040XP Reg/EDA	LCN
1 Kick Plate	K1050 x 10" High x CSK x 4BE	Rockwood
1 Stop	Refer to Part 2	Rockwood
1 Gasketing	5050 Adhesive	NGP

Set: 34.0

Description: Assembly Opening

1 Cylinder / Core where required	To Suit Device	Schlage

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Clear Float Glass.
   2. Clear Tempered Glass.
   3. Insulating Clear Glass with Low-E Coating.
   4. Insulating Clear Glass with Low-E Coating and Pattern.
   5. Insulating Spandrel Glass with Low-E Coating.
   6. Fire Rated and Impact Safety Rated Glass.
   7. Laminated Glass.
   8. Mirror Glass.
   9. Backpainted Glass Panels.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 – Alternates.

1.02 REFERENCES

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. GANA (GM) - GANA Glazing Manual; 2008.

G. GANA (SM) - GANA Sealant Manual; 2008.

H. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 2001.

I. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

1.03 SUBMITTALS

A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

B. Samples: Submit three samples 12 x 12 inches (305 x 305 mm) in size of glass and plastic units, showing coloration and design.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

1.05 MOCK-UP

A. Provide mockup of exterior wall including glass and air barrier and vapor retarder seal as indicated in Section 01 43 40.

B. Locate where directed.

1.06 WARRANTY

A. Provide a ten year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

B. Provide a ten year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants:
   1. Provide adhesives complying with South Coast Rule No. 1168 by the South Coast Air Quality Management District.
      a. Structural Glazing Adhesives: 100 g/l.

2.02 FLAT GLASS MATERIALS

A. Clear Float Glass (08 80 00.CF): Clear, annealed.
   1. Comply with ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
   2. Comply with ASTM C1048. Provide Type HS (heat strengthened) glass except where Type FT (fully tempered) is required.

B. Tempered Safety Glass (08 80 00.TS): Clear; fully tempered with horizontal tempering.
   1. Comply with ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select) and ASTM C1048.
   2. Comply with ANSI Z97.1.

C. Mirror Glass (08 80 00.M): ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select).
   1. Thickness: 1/4 inch (6 mm).
   2. Size: 72 inches (1820 mm) tall by 30 inches (760 mm) wide.

D. Laminated Acoustical Glass (08 80 00.LA):
   1. STC: 35.
   2. Total Unit Thickness: 9/16 inch (6 mm) nominal.
      a. 1/4 inch (3 mm) clear float glass.
      b. 0.060 inch (0.76 mm) PVB interlayer.
      c. 1/4 inch (3 mm) clear float glass.

E. Patterned Film Glazing (08 80 00.PF): Heat strengthened, clear.
   1. Applied film on interior surface.
   2. Film: polyester film with a pressure-sensitive adhesive backing applied to glass.
      a. Products:
         1) Basis of Design: 3M Graphics Solutions, solutions.3m.com; FASARA Vista (SH2FGVI).
         2) Avery Dennison Graphics Solutions, www.graphics.averydennison.com.
         3) Orafol Graphics Products, www.orafol.com.

F. Pattern Frit Glass (08 80 00.PF): Heat strengthened, clear.
   1. Ceramic fused frit on back surface.
   2. Pattern: Custom pattern provided by Architect.
   3. Color: White.

G. Spandrel Glass (08 80 00.SP): Heat strengthened, clear.
   1. Ceramic fused frit of color selected by Architect on back surface.

2.03 FIRE RATED GLAZING PRODUCTS

A. Fire Rated Safety Glass: (08 80 00.FS) Laminated Ceramic Glazing Material.
   1. Safety Rated: Laminated, Comply with ANSI Z97.1and CPSC 16 CFR 1201 (Cat I and II).
   2. Fire Rating: 20 minutes, 45 minutes, 60 minutes, 90 minutes, 3 hour with hose stream test.
   3. Thickness: 5/16 inch (8 mm) overall.
   4. STC Rating: 35dB.
   5. Products:
      a. FireLite Plus Premium Grade by Nippon Electric Glass Co., distributed by Technical Glass Products.

b. Pyran Platinum L; Schott North America, Inc.
c. Keralite Select Laminated by Vetrotech Saint Gobain North America.

2.04 SEALED INSULATING GLASS MATERIALS

A. General Requirements:
1. Comply with ASTM E 774 and E 773, Class CBA.
2. Purge interpane space with dry hermetic air.

B. Clear Insulating Low-E Glass Units (08 80 00.ICE): Double pane with glass to elastomer edge seal.
1. Outer pane of clear glass, inner pane of clear glass.
2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
3. Maximum Winter U-Value of unit: 0.24.
4. Maximum SHGC of 0.23.
5. Minimum Visible Light Transmittance: 49%.
6. Maximum Reflectivity, exterior: 19%.
7. Maximum Reflectivity, interior: 21%
8. Total unit thickness of 1 inch (25 mm) minimum.
9. Provide tempered units where indicated on drawings and where required by NC Building Code.
10. Products:
a. VNE1-53, by Viracon.
b. Guardian SNX-51/23, by Guardian certified fabricator.
c. Vitro Solarban 90, by Vitro certified fabricator.

C. Clear Insulating Low-E Pattern Glass Units (08 80 00.IFE) [Base Bid]: Double pane with glass to elastomer edge seal.
1. Outer pane of clear glass, inner pane of clear glass with patterned graphic film.
2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
3. Maximum Winter U-Value of unit: 0.24.
4. Maximum SHGC of 0.23.
5. Minimum Visible Light Transmittance: 49%.
6. Maximum Reflectivity, exterior: 19%.
7. Maximum Reflectivity, interior: 21%
8. Total unit thickness of 1 inch (25 mm) minimum.
9. Provide tempered units where indicated on drawings and where required by NC Building Code.
10. Products:
a. VNE1-53, by Viracon.
b. Guardian SNX-51/23, by Guardian certified fabricator.
c. Vitro Solarban 90, by Vitro certified fabricator.

D. Clear Insulating Low-E Pattern Frit Glass Units (08 80 00.IFE) [Alternate]: Double pane with glass to elastomer edge seal.
1. Outer pane of clear glass, inner pane of pattern frit glass.
2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
3. Maximum Winter U-Value of unit: 0.24.
4. Maximum SHGC of 0.23.
5. Minimum Visible Light Transmittance: 49%.
6. Maximum Reflectivity, exterior: 19%.
7. Maximum Reflectivity, interior: 21%
8. Total unit thickness of 1 inch (25 mm) minimum.
9. Provide tempered units where indicated on drawings and where required by NC Building Code.
10. Products:
a. VNE1-53, by Viracon.
b. Guardian SNX-51/23, by Guardian certified fabricator.

c. Vitro Solarban 90, by Vitro certified fabricator.

E. Clear Insulating Low-E Spandrel Glass Units (08 80 00.ISE): Double pane with glass to elastomer edge seal.
1. Outer pane of clear glass, inner pane of spandrel glass.
2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
3. Maximum Winter U-Value of unit: 0.24.
4. Total unit thickness of 1 inch (25 mm) minimum.
5. Provide tempered units where indicated on drawings and where required by NC Building Code.
6. Products:
a. VNE1-53, by Viracon.
b. Guardian SNX-51/23, by Guardian certified fabricator.
c. Vitro Solarban 90, by Vitro certified fabricator.

F. Edge Seal Construction: Manufacturer's standard warm-edge spacer.

2.05 GLASS WRITEABLE PANELS

A. Backpainted Writeable Glass Panel (08 80 00.BGP):
1. Basis of Design: Clarus; Wall2Wall.
2. Other acceptable products:
a. Pulp Studio; Pintura AR.
b. Gardner Glass Products; Dreamwalls Backpainted Glass.
3. Non-magnetic, non-reflective, anti-scratch, 1/4" low iron, tempered safety glass with polished edges all four sides.
a. Color: Custom to match SW 9150 Endless Sea.
b. Size and Configuration: As shown on Drawings.
c. Attachments: Concealed Z clips.

2.06 ACCESSORIES

A. Mirror Attachment Accessories: Top and bottom continuous aluminum J-channels, clear anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

B. Install sealants in accordance with ASTM C1193 and GANA (SM).

C. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install glazing in accordance with GANA (GM) and system manufacturer's instructions.

B. Install mirrors with a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

3.04 INSTALLATION – FIRE RATED GLAZING

A. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

B. Place glazing tape of free perimeter of glazing in same manner described above.

C. Do not remove protective edge tape.

D. Install removable stop without displacement of tape.

E. Do not pressure glaze.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 08 87 00 - ARCHITECTURAL GRAPHIC FILMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Decorative interior film on walls.
   2. Decorative interior window film.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM International (ASTM)
   1. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
   2. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

1.03 ACTION SUBMITTALS

A. Product Data: For specified products.

B. Shop drawings: Showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

C. Samples: 4 inch by 4 inch samples of each specified texture, color and/or pattern for verification.

1.04 INFORMATIONAL SUBMITTALS

A. Mock-ups as indicated in Quality Assurance article below.

B. Adhesion test results indicated in Surface Preparation article in Part 3.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.

B. Electronic files with final artwork and any other information required to allow Owner to produce graphic film for repair or replacement of installed film.

C. Manufacturer warranty.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Materials: Furnish 2 percent extra material at time of installation. Deliver in protective packaging for storage and label contents appropriately.

1.07 QUALITY ASSURANCE

A. Obtain all products in this section from a single manufacturer with a minimum of 10 years' experience.

B. Installer: Installation shall be performed by a trained and qualified installer, specialized and experienced in work required for this project.

C. Mock-ups:
   1. Architect to provide vector artwork samples for graphic film mockups.
   2. Coordinate color profiles, transparency flattening, and artwork files with Architect prior to printing.
   3. All film mockups to be printed on specified film products using the same subcontractor, ink, settings and equipment to be utilized for the finished work.
   4. Printed mock-ups: two (2) 24" x 24" film samples at full scale from each location/artwork included in the project, provided as loose pieces of film.
   5. Installed mock-ups: two (2) 24" x 24" film samples at full scale of each type of graphic film included in the project, to be installed for review in locations selected by Architect. Film samples installed for mockup may not remain as part of the finished work.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.

C. Product must remain in original plastic bag and boxes and have storage conditions as follows:
   1. 40 °F - 90 °F (4 °C - 32 °C).
   2. Out of direct sunlight.
   3. Clean dry area.
   4. Original container.
   5. Do not stack boxes over six (6) units high. Excessive weight can damage the film.
   6. Handle products in accordance with manufacturer's instructions.

1.09 PROJECT/SITE CONDITIONS

A. Confirm substrate is suitable for mounting of glass finish components prior to start of installation.

B. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.10 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard warranty document by authorized manufacturer.

PART 2 PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Provide graphic film and overlaminate from single manufacturer.

B. Ink process: provide latex ink process for all digitally printed films.

C. Color variation: graphic film fabricator to use film manufacturer's product-appropriate ICC color profiles for all graphic processing and production. Graphic film materials within any single continuous area of artwork to be from single roll or product lot.

D. Architect to provide final digital artwork.

2.02 MATERIALS

A. General: Glass finishes field-applied application to glass material as visual opaque or decorative film.

B. Fire Performance: Surface burning characteristics when tested in accordance with ASTM E 84: Class A
   1. Flame Spread: 25 maximum.
   2. Smoke Developed: 450 maximum.

C. Graphic Film 1 (08 87 00.GF1):
   1. Application: digitally-printed opaque film installed over latex paint on gypsum board partition.
   2. Pattern: custom cut pattern; Architect to provide final vector graphic prior to production.
   3. Products:
      a. Avery Dennison Graphics Solutions, www.graphics.averydennison.com.
         1) Graphic film: MPI 1005.
         2) Overlaminate: DOL 1080.
      b. 3M Graphics Solutions, solutions.3m.com/wps/portal/3M/en_US/Graphics/3Mgraphics.
         1) Graphic film: Controltac IJ180.
         2) Overlaminate: Scotchcal 8520.

c. Orafol Graphics Products, www.orafol.com/gp/americas/en/frontpage.
1) Graphic film: Orajet 3751RA.
2) Overlaminate: Oraguard 290 Matte.

D. Graphic Film 2 (08 87 00.GF2):
1. Application: digitally printed transparent film installed on glass.
2. Pattern: custom cut pattern; Architect to provide final vector graphic prior to production.
3. Products:
a. Avery Dennison Graphics Solutions, www.graphics.averydennison.com.
1) Graphic film: SF100-103 Ultra Clear.
2) Overlaminate: DOL 6060.
b. 3M Graphics Solutions, solutions.3m.com/wps/portal/3M/en_US/Graphics/3Mgraphics.
1) Graphic film: Scotchcal Clear View IJ8150.
2) Overlaminate: Scotchcal 8914.
c. Orafol Graphics Products, www.orafol.com/gp/americas/en/frontpage.
1) Graphic film: Orajet 3751RA Transparent.
2) Overlaminate: Oraguard 290GF.

E. Adhesive: As recommended by manufacturer for product.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate(s) for compliance. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Refer to the manufacturer's installation instructions to determine compatibility of finish to substrate.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. General:
1. Comply with all manufacturer’s instructions for surface preparation.
2. Thoroughly clean substrate of substances that could impair the overlay’s bond, including mold, mildew, oil, grease.
3. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.

B. Gypsum Board Scheduled to Receive Graphic Film 1:
1. Finish gypsum board to Level 5 as specified in Section 09 21 16 - Gypsum Board Assemblies.
2. Verify that paints on gypsum board scheduled to receive Graphic Film 1 have fully cured.
3. Use cleaning procedure and testing protocol described in 3M Instruction Bulletin 5.37, "A Guide to Understanding and Applying Graphics to Common Smooth and Textured Wall Surfaces".
4. Submit adhesion test results to Architect for review prior to printing.

3.03 APPLICATION

A. Application must be performed by qualified installer.

B. Do not proceed with installation until all finishing work has been completed in and around the work area.

C. Verify pattern prior to material acquisition.

D. Comply with manufacturer’s installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

E. Remove the liner and wet the adhesive prior to installation.

F. Form smooth, wrinkle-free, bubble-free surface for finished installation.

G. Remove air bubbles, wrinkles, blisters and other defects. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.

3.04 CLEANING AND PROTECTION

A. Use cleaning methods recommended by glazing film manufacturer for applicable environment.

B. Protect completed glass finish during remainder of construction period.

END OF SECTION

SECTION 08 87 23 - SAFETY AND SECURITY FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing film applied to new glazing assemblies.

B. New Glazing: Factory or shop install film to glazing before installation in frames.

C. Glazing assemblies to receive film are indicated on drawings.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

B. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

C. Samples: For each film product to be used, minimum size 4 inches (102 mm) by 6 inches (152 mm), representing actual product, color, and patterns.

D. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Specimen Warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

B. Installer Qualifications: Certified by glazing film manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

A. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 60 00 - Product Requirements.

2.02 MANUFACTURERS

A. 3M Window Film; Safety & Security Window Film Ultra Series: www.solutions.3m.com/#sle.

B. Avery Dennison; Safety and Security Films: www.averydennison.com/#sle.

C. Llumar, an Eastman Chemical Company; Safety and Security Window Film, Llumar: www.llumar.com/#sle.

2.03 MATERIALS

A. Glazing Film: Transparent polyester film for permanent bonding to glass.
   1. Thickness: 0.008 inch (0.2 mm), minimum.
   2. Color: Clear.
   3. Construction: Multi-ply laminate.
   4. Adhesive Type: Manufacturer's standard recommended formulation.
   5. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).

B. Accessory Materials: As recommended or required by film manufacturer.

PART 3 EXECUTION

3.01 FABRICATION

A. Install film on substrate glazing unit in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

B. Accurately cut film with straight edges to required sizes allowing 1/16 inch (2 mm) to 1/8 inch (3 mm) gap at perimeter of glazed panel unless otherwise required by anchorage method.

C. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Final Completion.

END OF SECTION

SECTION 08 91 00 - LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012 (Reapproved 2015).

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021.

1.03 SUBMITTALS

A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

C. Samples: Submit three samples 2 by 2 inches (50 by 50 mm) in size illustrating finish and color of exterior surfaces.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 WARRANTY

A. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Air Balance: www.airbalance.com.
   2. Airolite Company, LLC: www.airolite.com.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. Ruskin Company: www.ruskin.com.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft (3.1 g/sq m) water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with concealed intermediate mullions.
   1. Free Area: 50 percent, minimum.

2. Blades: Drainable.
3. Frame: 4 inches (100 mm) deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
4. Aluminum Thickness: Frame 12 gauge, 0.0808 inch (2.05 mm) minimum; blades 12 gauge, 0.0808 inch (2.05 mm) minimum.
5. Aluminum Finish: Superior performing organic coatings; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).

B. Color: Custom, to match approved sample.

2.05 ACCESSORIES

A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch (38 mm) thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

C. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch (1.63 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.

D. Insect Screen: 18 x 16 size aluminum mesh.

E. Fasteners and Anchors: Stainless steel.

F. Flashings: Of same material as louver frame, extruded to required shape, single length in one piece per location.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Coordinate with installation of mechanical ductwork.

END OF SECTION

SECTION 08 92 00 - LOUVERED EQUIPMENT ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvered aluminum gates.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2020, with Errata (2022).

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.

B. Shop Drawings: Include plans, sections, and details of connections and bracing.
   1. Include structural calculations indicating compliance with wind loading requirements.

C. Verification Samples: Three samples, minimum size 8 inches (200 mm) square, representing actual product configuration, color, and texture.

D. Specimen warranty.

1.04 WARRANTY

A. Aluminum Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvered Equipment Enclosures:
   1. Patriot Custom Metals DBA PalmSHIELD: www.palmshieldlouvers.com.
   2. Greco Aluminum Railings: www.grecorailings.com.
   3. Industrial Louvers, Inc: www.industriallouvers.com.

2.02 APPLICATIONS

A. Screens for concealing equipment.

2.03 PERFORMANCE REQUIREMENTS

A. Wind Resistance: Design louvered enclosures, including support posts, to withstand positive and negative wind loading in accordance with applicable building code.

2.04 EXTRUDED HORIZONTAL LOUVERED SCREENS

A. Overall Screen Configuration: Dimensions, details, and layout as indicated on drawings.

B. Construction: Individual extruded aluminum louvers in inverted overlapping configuration, with blade supports attached to and supported by customized support structure.
   1. Louver Blades: Alloy 6063-T5 or T6 temper, or equivalent in accordance with ASTM B221 (ASTM B221M), 0.081 inch (2.06 mm) thick, 4 inch (102 mm) deep, spaced at 5 inch (127 mm) on center, and configured to totally block sightlines from grade.

C. Aluminum Finish: Factory finish louvers and accessories using system indicated below.
   1. Color: Custom to match Architect's sample.

2.05 ALUMINUM FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).

2.06 ACCESSORIES

A. Miscellaneous Trim: ASTM B209/B209M aluminum sheet, alloy 3005-H25 temper, or equivalent, formed to shapes indicated and finished to match other components.

B. Support Structure: See Drawings.

C. Fasteners: Self-tapping stainless steel screws, as approved by manufacturer of equipment screens.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment screens in accordance with manufacturer's printed instructions and as indicated on shop drawings.

B. Form tight joints and fit exposed connections accurately.

C. Provide necessary fastenings and anchors required for a complete installation, and install units plumb, level, and in proper alignment with adjacent work.

3.02 PROTECTION

A. Protect installed products until completion of project.

B. Protect metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry or dissimilar metals.

C. Touch-up, repair, or replace damaged products before Date of Final Acceptance.

END OF SECTION

SECTION 09 05 10 - CEILING COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coordination of ceiling system installation with work of other sections, including those listed below.

1.02 SUBMITTALS

A. Coordination Drawings: Submit reflected ceiling plans showing correlation between work of this section and work of other sections.
   1. Minimum drawing scale: 1/8 inch equals 1 foot.

B. Show the following:
   1. Joints in ceilings.
   2. Light fixtures.
   3. HVAC equipment.
   4. Fire suppression system components.
   5. Loud speakers.
   6. Partitions.
   7. Equipment and valves requiring access panels.
   8. Access panels in ceilings.
   9. Other items within ceilings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. Make adjustments in the location of such elements as directed by the Architect, without change in contract time or price.

B. Prepare and distribute to affected installers, data necessary for coordination with related work.

C. Do not begin construction of any of these elements prior to such coordination.

END OF SECTION

SECTION 09 05 61 - PREPARATION OF CONCRETE TO RECEIVE ADHESIVELY INSTALLED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing of bare concrete floors that will receive adhesively applied floor coverings, including the following:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Ceramic tile and stone tile (with or without an intervening waterproofing or crack-suppression membrane) utilizing a thin or thick set cementitious mortar bed that is bonded to the substrate.
   4. Epoxy terrazzo.

B. Testing of new concrete floor slabs for moisture.

C. Testing of new concrete floor slabs for pH.

D. Testing of floor slabs for adhesive bond.

E. Preparation of concrete floor slabs for installation of floor coverings.

F. Remediation of concrete floor slabs where testing indicates unsatisfactory moisture or pH conditions or unsatisfactory adhesive bond.
   1. Contractor shall perform all specified remediation of concrete floor slabs.

1.02 OTHER WORK

A. Testing of floors that will receive resinous flooring is specified in this Section.

1.03 PRICE AND PAYMENT PROCEDURES

A. Moisture and pH testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Include the cost of moisture and pH testing in the base bid.

C. Include the cost of standard adhesive in the base bid.

D. Unit Prices: See Section 01 22 00 - Unit Prices.

E. Unit Price for Standard Flooring Adhesive: State on the bid form the unit price per square foot (square meter) for using the floor covering manufacturer's standard adhesive.
   1. Provide a unit price for each distinct type of floor covering.

F. Unit Price for Moisture-Resistant Flooring Adhesive: State on the bid form the unit price per square foot (square meter) for using the moisture-resistant flooring adhesive.
   1. Provide a unit price for each distinct type of floor covering.

G. Unit Price for Moisture-Resistant Sealer-Surfacer: State on the bid form the unit price per square foot (square meter) for the moisture-resistant sealer-surfacer.
   1. Provide a unit price for each distinct type of floor covering.

1.04 REFERENCES

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 2020.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2021.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and pH limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report: Include:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and pH test reports in the format required by referenced test method.
   4. Copies of specified test methods.

C. Adhesive Bond and Compatibility Test Report.

D. Product Data: Manufacturer's published data on each product specified in Part 2.
   1. Manufacturer's installation instructions.

E. Moisture-Resistant Installer Qualifications: Signed by the materials manufacturer.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified, and acceptable to the Owner.

B. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Allow ample time for testing activity and remedial measures, if necessary, in the Construction Project Schedule. Notify Owner and Architectwhen specified ambient conditions have been achieved, and coordinate dates of testing with the parties involved.

C. Moisture-resistant sealer-surfacer Installer: Approved by materials manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 FIELD CONDITIONS

A. In spaces where concrete testing will be performed, maintain ambient temperature at anticipated in-service temperature for not less than 48 hours prior to and during testing.

B. In spaces where concrete testing will be performed, maintain relative humidity at anticipated in-service humidity level for not less than 48 hours prior to and during testing.

PART 2 PRODUCTS

2.01 REMEDIATIONS

A. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.

B. Excessive Moisture Emission or Relative Humidity or excessive pH: If an adhesive that is resistant to the level of moisture and pH present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply Moisture-Resistant Sealer-Surfacer over entire floor area.

2.02 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious compound, resistant to moisture, mildew, and alkali, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi (21 MPa), minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Moisture-Resistant Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Moisture-Resistant Sealer-Surfacer: Multi-coat system comprising epoxy sealer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, followed by surfacing coat that acts to relieve osmotic vapor pressure and provides a suitable profile for adhesion of floor coverings without further treatment.
   1. Mechanically abrade concrete to achieve ICRI Concrete Surface Profile (CSP) of 3 before applying moisture-resistant sealer-surfacer.
   2. Products:
      a. ARDEX Engineered Cements; www.ardexamericas.com.
         1) 3-coat system: Ardex MC Rapid, Ardex P 82 Ultra Prime, and either Ardex Feather Finish, Ardex V1200, or Ardex K13 depending on project conditions.
      b. Koster American Corporation; www.kosterusa.com.
         1) 3-coat system: Koster VAP I 2000, Koster I 09 Primer, Koster SL Premium.
      c. Sika Corporation; www.sikafloorusa.com.
         1) 3-coat system: Sika MB, SikaLevel-02 EZ Primer, and either SikaLevel Skim Coat, SikaLevel-125, or SikaLevel-325.

PART 3 EXECUTION

3.01 GENERAL

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Testing.
      a. Perform the following types of test in close proximity to each other:
      b. Internal Relative Humidity Tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer. Ensure that a portion of the tests are adjacent to exterior walls and to expansion and control joints.
      c. pH tests; at same frequency as other tests.
   3. Specified moisture remediation, if required.
   4. Patching, smoothing, and leveling, as required.
   5. Other preparation specified.
   6. Adhesive bond test performed by flooring installer.
   7. Protection.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

3.03 INTERNAL RELATIVE HUMIDITY TESTING

A. Test new concrete floors for relative humidity.

B. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

C. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

D. Test in accordance with ASTM F2170 Procedure A and as follows.

E. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

F. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

G. Report: Report the information required by the test method.

3.04 PH TESTING

A. Test new concrete floors for pH.

B. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

C. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

D. Use a wide range pH paper, its associated chart, and distilled or deionized water.

E. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.

F. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Test floors for adhesive bond of floor covering to floor slabs that have been prepared in accordance with floor covering manufacturer's recommendations.

B. In the event that bond does not comply with floor covering manufacturer's requirements, perform surface preparation and remediation as recommended by floor covering manufacturer.

3.06 REMEDIATION OF FLOORS TO RECEIVE FLOOR COVERING

A. Comply with requirements and recommendations of product manufacturer.

B. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities as recommended by product manufacturer.

C. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 06 10 - PARTITION SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Partitions faced with gypsum panels, and including facings of:
   1. Gypsum wallboard.
   2. Water-resistant gypsum backing board.
   3. Gypsum board shaft wall with any of the above facings.

B. Partitions of concrete unit masonry (CMU) with or without gypsum panel facings.

1.02 DEFINITIONS

A. Partitions: Every partition dividing two spaces is a noise, air, and dust control partition.

PART 2 PRODUCTS

2.01 GYPSUM PANEL FACINGS

A. Provide types of gypsum panels in locations listed below.

B. General use, and where not otherwise indicated:
   1. Provide gypsum wallboard.

2.02 PRODUCTS

A. Provide products specified elsewhere in Division 04 and Division 09.

PART 3 EXECUTION

3.01 GENERAL

A. Construct partitions in accordance with requirements specified elsewhere in Division 04, Division 05, and Division 09.

B. Seal smoke, noise, air, and dust partitions in accordance with requirements specified in Gypsum Board Assemblies section and Joint Sealers section.

3.02 PARTITION LEGEND

A. On the drawings, partition types are indicated using tags composed generally as follows (see individual descriptions in partition schedule below for specific requirements).

B. First Position: Fire rating.
   1. Zero, 1, 2, 3, or 4 hours.

C. Second Position: Construction Material. Extend all partitions and materials from floor to overhead solid structure unless otherwise indicated.
   1. A — Metal studs and gypsum panels from floor to 6 inches (150 mm) above ceiling.
   2. CH — Shaft wall (using CH studs typical.)
   3. M — Masonry (CMU typical.)
   4. SA — Metal studs to structure, gypsum panels from floor to 6 inches (150 mm) above ceiling.
   5. S — Metal studs and gypsum panels.
   6. U — Steel studs and gypsum board from floor to underside of ceiling.

D. Third Position: Indicates construction features as described under individual descriptions in partition schedule below.

E. Fourth Position:
   1. G — Gypsum panels (wallboard, tile backer, veneer base, etc.); type of panel as specified above under "gypsum panel facings".

F. Final Position, outside of box on drawings:

1. Dimension of stud or masonry measured to outside face. Dimensions of stud are actual. Dimensions of masonry are actual unless indicated otherwise.
2. Where no stud dimension is indicated adjacent to box, provide 3-5/8 inches (92 mm) studs unless otherwise noted below.
3. Where no dimension is indicated adjacent to box for shaftwall framing, provide 4 inches (100 mm) framing.

3.03 PARTITION SCHEDULE

0 A 2 G:
No fire rating.
Metal studs from floor to 6 inches (150 mm) above ceiling.
Gypsum panels both sides; extend from floor to 6 inches (150 mm) above ceiling.

0 D 2 G:
Partial height room divider.
No fire rating.
Metal studs from floor to height indicated.
Gypsum panels both sides, with gypsum return at head and jambs unless otherwise indicated.

0 S 1 G:
No fire rating.
Metal studs to structure.
Gypsum panels 1 side only.

0 S 2 G:
No fire rating.
Metal studs to structure.
Gypsum panels 1 side only, 2 layers.

0 S 5 G:
No fire rating.
Cold formed metal studs to structure.
Gypsum panels 1 side only.

0 S 40 G:
No fire rating.
Construct metal stud, gypsum panel partition per UL Des. U465.
No batts.

0 S 49 G:
No fire rating.
Construct metal stud, gypsum panel partition per UL Des. U465.
Install mineral fiber batts in stud cavities. No resilient channels.

0 S 50 G:
No fire rating.
Construct cold formed metal stud, gypsum panel partition per UL Des. U465.
Install mineral fiber batts in stud cavities. No resilient channels.

0 S 55 G:
No fire rating.
Construct metal stud, gypsum panel partition per UL Des. U465
Install mineral fiber batts in stud cavities. Install second layer gypsum panel on one side.

0 S 56 G:
No fire rating. Construct metal stud, gypsum panel partition per UL Des. U411.
Install mineral fiber batts in stud cavities.

0 SA 1 G:
No fire rating.
Metal studs to structure.

Gypsum panels 1 side only; extend from floor to 6 inches (150 mm) above ceiling.

0 Z 1 G:

No fire rating.
Metal furring channels (Z-shaped), 1 layer gypsum panels.

1 CH 39 G:

1 hr. fire rating; construct shaftwall per UL Des. U415A.
No batts.

1 M 49:

1 hr. fire rating; construct concrete masonry unit partition.

1 S 40 G:

1 hr. fire rating; construct metal stud, gypsum panel partition per UL Des. U465.
No batts.
No resilient channels.

1 S 49 G:

1 hr. fire rating; construct metal stud, gypsum panel partition per UL Des. U465.
Install mineral fiber batts in stud cavities. No resilient channels.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior metal stud wall framing.
B. Interior metal shaftwall framing and bracing systems.
C. Metal "Z" furring.
D. Acoustic insulation.
E. Gypsum wallboard.
F. Impact-resistant gypsum wallboard.
G. Glass mat faced tile backing board.
H. Gypsum wallboard (GWB) with setting-type joint compound to receive high performance coatings specified in Section 09 96 00.
I. Interior gypsum ceilings/soffits.
J. Joint treatment and accessories.
K. Level 5 finish under semi-gloss and gloss paint.
L. Aluminum Trim.
M. Aluminum Wall and Ceiling Coving with vinyl anchor strips, including sealing of joints and seams.

1.02 REFERENCES

A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2020.
D. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.
E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
F. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2019.
G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
H. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.
I. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
K. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
L. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.
M. GA-600 - Fire Resistance Design Manual Sound Control; 2021.
N. ITS (DIR) - Directory of Listed Products; current edition.
O. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's product data for systems required. Include installation instructions and data sufficient to show compliance with requirements.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Samples: Submit two samples of aluminum wall and ceiling coving.
   1. 8-inch long straight section.
   2. 3-way inside corner casting transition.

D. Design Data:
   1. Submit data substantiating gauge and spacing of metal framing members to comply with specified loading requirements.
   2. Submit data substantiating bracing requirements.
   3. Submittal of manufacturer's standard published load tables, marked to show products selected to comply with design requirements and project conditions, will be acceptable. Where manufacturer's standard published load tables are not adequate to demonstrate compliance with design requirements and project conditions, submit design data bearing the seal of a professional engineer licensed to practice in the state in which the project is located.

1.04 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: A firm fabricating aluminum cleanroom wall and ceiling coving with minimum five years' experience.

B. Perform in accordance with ASTM C840.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original and unopened packages, containers, or bundles, with brand names and manufacturer's labels intact and legible.

B. Store materials in dry location, fully protected from weather and direct exposure to sunlight.

C. Stack gypsum board products flat and level, properly supported to prevent sagging or damage to ends and edges.

D. Store corner bead and other metal and plastic accessories to prevent bending, sagging, distortion, or other mechanical damage.

1.06 PROJECT CONDITIONS

A. Do not store or install products until building is fully enclosed and temperature and humidity controlled.

B. Temperature: Maintain temperature in areas of installation between 50 to 80 deg F. (10 to 26.5 deg C.) for at least 48 hours before installation begins and continuously thereafter.

C. Ventilation: Provide controlled ventilation and dehumidification.

D. Do not allow excessive variations in humidity or temperature.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants:
   1. Provide adhesives complying with South Coast Rule No. 1168 by the South Coast Air Quality Management District.
      a. Drywall and Panel Adhesives: 50 g/l.

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel of size and properties necessary to comply with ASTM C754, for the spacing indicated.
   1. Studs: C-shaped .

a. Nominal depths: As indicated in Section 09 06 10 or as otherwise indicated on the drawings.

2. Runners: U-shaped, sized to match studs.
   a. Nominal depths: As indicated in Section 09 06 10 or as otherwise indicated on the drawings.
3. Ceiling Channels: C-shaped, cold-rolled.
4. Pony Wall Supports: Partial wall framing connection to floor.
   a. Base plate: minimum 8" long.
   b. Height: manufacturer's maximum size available for wall height.
   c. Install in partial-height walls where indicated in Drawings.
5. Furring:
   a. Hat-shaped, minimum depth of 7/8 inch (22 mm), except as otherwise indicated.
   b. C-shaped studs, in locations indicated.
   c. Manufacturer's standard galvanized Z-shaped furring members designed for screw attachment, in locations indicated.
6. Maximum deflection of shaftwall framing of L/240 at 7.5 psf (360 Pa).
7. Maximum deflection of wall framing of L/240 at 5 psf (240 Pa).
   a. For wall framing to receive ceramic tile: L/360 at 5 psf (239 Pa).
8. At partial height partions, provide each framing member capable of resisting the following:
   a. Moment: 1130 ft-lbf.
   b. Allowable distributed load: 90 lbf / ft.
   c. Allowable point load at top of member: 225 lbf.
9. Thickness: Provide thickness as required for span, loading, deflection, and other required criteria.
   a. Minimum thickness, all locations, unless otherwise indicated: 0.031 inch (0.80 mm) design thickness / 0.03 inch (0.75 mm) minimum base metal thickness.
   b. Minimum thickness, abuse resistant or impact resistant gypsum board locations: 0.031 inch (0.80 mm) design thickness / 0.03 inch (0.75 mm) minimum base metal thickness.
   c. Minimum thickness, tile backer board locations: 0.031 inch (0.80 mm) design thickness / 0.03 inch (0.75 mm) minimum base metal thickness.
   d. Minimum thickness, Z-shaped furring: 26 gauge, 0.016 inch (0.40 mm).
   e. So-called "EQ" or "equivalent gauge" framing with thickness equal to or greater than specified above is acceptable. So-called "EQ" or "equivalent gauge" framing with thickness less than specified above is not acceptable.
10. Finish: G40 hot-dip galvanized per ASTM A653/A653M.
    a. So-called "G40e" equivalent coating is not acceptable.
11. Stud spacing: 16 inches (400 mm), maximum.
12. Shaftwall framing spacing: 24 inches (600 mm), maximum.
13. Furring spacing: 16 inches (400 mm) on center, maximum.

B. Establish bracing size and spacing for the following partitions. (See Section 09 06 10 - Partition Schedule):
   1. Type A.
   2. Type SA.
   3. Type U.
   4. Type F and Z when furring is installed over spaced supports.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head To Structure Connections:
   1. Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.
   2. Provide fire-rated design at fire-rated partitions listed by UL (DIR), ITS (DIR), or GA-600.

2.03 WALL AND CEILING BOARD MATERIALS AND ACCESSORIES FOR SURFACES TO RECEIVE HIGH PERFORMANCE COATINGS

A. Where surfaces will receive high performance coatings specified in Section 09 96 00 - High Performance Coatings, provide board materials and accessories as specified herein.

B. Ordinary GWB plus Setting Type Joint Compound:
   1. Panels as specified below for "all other surfaces".
   2. Joint Compound: High strength, high density setting type.
   3. Joint Tape: Paper or alkali-resistant mesh type, as recommended for use with setting type joint compound by compound manufacturer.
   4. Other accessories as specified below for "all other surfaces".

2.04 GYPSUM BOARD MATERIALS - ALL OTHER SURFACES

A. Gypsum Wallboard: ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Edges: Tapered; beveled or rounded.
   2. Thickness: 5/8 inch (16 mm), all locations. 1/2 inch (13 mm) not acceptable.
   3. Type X: Fire resistant, UL or Intertek rated.

B. Gypsum Wallboard for "pre-rock" installation where the building is not yet fully enclosed: Glass mat faced board recommended by manufacturer for pre-rock installation. Paper-faced board is not acceptable.
   1. Glass-mat-faced board, paper-faced board not acceptable.
   2. Level 5 finish, all locations.
   3. Compliant with other criteria specified for use and location.
   4. Products:
      a. Standard Wallboard:
         1) Certainteed: GlasRoc Interior Type X Drywall Panels.
         2) Georgia-Pacific DensArmor Plus Fireguard Interior Panels.
         3) USG Sheetrock Brand Glass Mat Panels Mold Tough Firecode X".
      b. Impact-Resistant Wallboard:
         1) Georgia-Pacific DensArmor Plus Fireguard Interior Panels Impact Resistant.
         2) Sheetrock Brand Glass Mat Panels Mold Tough VHI Firecode X.
   5. Substitutions are not acceptable.
   6. Additional Finishing Requirements when "pre-rock" board is used in lieu of other board: Apply an additional full skim coat to the surface in accordance with wallboard manufacturer's written recommendations.
      a. Where a Level 4 Finish is specified, perform all steps to achieve a Level 4 Finish, then install a full skim coat to the surface.
      b. Where a Level 5 Finish is specified, perform all steps to achieve a Level 5 Finish.

C. Impact-Resistant Gypsum Wallboard: ASTM C1396/C1396M. Gypsum wallboard especially formulated for resistance to panel breakage. Gypsum fiber panels or wallboard with enhanced gypsum core and heavy duty face and back paper.
   1. Thickness: 5/8 inch (16 mm), Type X.
   2. Edges: Tapered.
   3. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M (test sample may be primed and painted).
   4. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   6. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   7. Products:
      a. Certainteed Extreme Impact Resistant Gypsum Board with M2Tech.
      b. Georgia-Pacific: DensArmor Plus Impact-Resistant Interior Panels.
      c. USG Corporation: Mold Tough VHI.

D. Glass Mat Faced Gypsum Backing Board: ASTM C1178/C1178M.
   1. Core: Water-resistant silicone-treated gypsum core.
   2. Facers: Alkali-resistant fiberglass mat front and back. Front face surfaced with water and vapor barrier coating.
   3. Thickness: 5/8 inch (16 mm), Type X unless noted otherwise on Drawings.
   4. Product:
      a. Georgia-Pacific Corporation: Dens-Shield Tile Backer Firestop Type X.
      b. USG Durock Brand Glass-Mat Tile Backerboard Firecode Type X.
      c. CertainTeed GlasRoc Tile Backer Type X.

E. Gypsum Shaftliner Board: ASTM C1396/C1396M; sizes to minimize joints in place; 1 inch (25 mm) thick; square edges, ends square cut.

2.05 ACCESSORIES - ALL OTHER SURFACES

A. Except as otherwise specifically indicated, provide trim and accessories by manufacturer of gypsum board materials, made of galvanized steel or zinc alloy and configured for concealment in joint compound.
   1. Include corner beads, edge trim, and other trim units necessary for project conditions. Provide accessories as required in order to achieve details indicated, whether or not specific accessories are shown on the drawings.
   2. Exposed trim: At locations indicated, provide manufacturer's standard metal units designed to be left exposed or semi-exposed.

B. Corner Beads: Galvanized steel.

C. Edge Trim: LC bead, as defined in ASTM C 840.

D. Control Joints: At locations indicated, provide manufacturer's standard one-piece control joints of zinc alloy.

E. Aluminum Trim: Extruded Aluminum alloy 6063-T5, pre-punched for screw attachment, formed to receive gypsum compound.
   1. Finish:
      a. Anodized Finish.
         1) Clear.
   2. Manufacturers:
      a. Basis of Design: Fry Reglet Corporation.
   3. Products:
      a. Reveal Base Molding at gypsum board partitions; 4 inch (102 mm) reveal (TB)
         1) Fry Reglet DRMB-625-400.
      b. "F" reveal molding, 5/8 inch (16 mm) depth, 1 inch (25 mm) reveal width (TFR1):
         1) Fry Reglet DRMCT-625-100.
      c. "F" reveal molding, 5/8 inch (16 mm) depth, 1/2 inch (13 mm) reveal width (TFR2):
         1) Fry Reglet DRMF-625-50.
   4. Provide factory-fabricated "T", "L", and "cross" intersections.

F. Aluminum Cove Trim (ACT):
   1. Basis-of-Design Product: Gordon Inc.; CleanCove Coving System.
   2. Other acceptable manufacturers:
      a. AES Cleanroom Systems, Inc.
      b. Portafab Building Systems, Inc.
   3. Coving:
      a. Material: Extruded aluminum.
      b. Height when installed: Minimum 2-inches.
      c. Finish: Manufacturer's standard powder coat.
         1) Color: Manufacturer's standard white.
   4. Vinyl anchor strip: extruded vinyl with serrated boss.
   5. 3-way Inside Corner: Manufacturer's standard metal casting.
   6. Sealant: As specified in Section 07 92 00 - Joint Sealants.

a. Color: White.

G. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Joint Compound:
a. General Interior Use: Ready-mixed vinyl-based joint compound. All-purpose taping and topping compound: type specifically formulated for embedding tape and accessories, for prefilling, and for finishing drywall.
b. Abuse or Impact-Resistant Board: Provide ready mixed or setting type compound as recommended by abuse-resistant board manufacturer.
c. Gypsum board intended for High Performance Coating specified in Section 09 96 00: Provide setting type compound specifically recommended by manufacturer of gypsum board.
d. Glass mat faced gypsum backing board: Tile setting compound as specified in tile section.
2. Joint Tape:
a. Gypsum wallboard: Provide manufacturer's standard paper type tape.
b. Abuse or Impact-Resistant Board: Provide paper type or fiberglass as recommended by the abuse resistant board manufacturer.
c. Glass mat faced backer board: 2 inches (51 mm)-wide fiberglass mesh tape.

H. Screws: ASTM C1002; self-piercing tapping type, lengths as recommended by gypsum board manufacturer for project conditions.
1. Provide corrosion resistant screws for glass mat faced gypsum backing board.

I. Furring Fasteners/Connectors: Manufacturer's recommended system for specific application indicated, complying with ASTM C754.

J. Hanger Wire: ASTM A641/A641M, soft, Class 1 galvanized.
1. Ceiling hangers: Minimum 8 gauge, 0.16 inch (4.06 mm) wire.

K. Blocking: Provide metal blocking for mounting of wall cabinets, shelves, toilet accessories, etc.
1. Provide 3-5/8 inch (92 mm), 16 gauge, 0.064 inch (1.62 mm), steel runner notched to bypass steel studs and secured with two 3/8 inch (10 mm) pan head screws.

2.06 ACOUSTICAL MATERIALS

A. Sound Attenuation Batts: ASTM C665, Type I; unfaced semirigid mineral wool batt (made from rock or slag); thickness as follows:
1. Use 1-1/2 inch (38 mm) batts in 1-5/8 inch (41 mm) studs.
2. Use 2 inch (51 mm) batts in 2-1/2 inch (64 mm) studs.
3. Use 3 inch (76 mm) batts in 3-5/8 inch (92 mm) and wider studs.
4. Where batts are required in furred spaces, use batt thickness equal to furring depth.

B. Acoustical Sealants:
1. Concealed Locations: ASTM C919. Acrylic emulsion latex or water-based elastomeric sealant. Recommended by manufacturer for use in acoustical sealing applications.
a. Acceptable Products include:
1) Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
2) Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
2. Exposed Locations: Joint sealant specified in Section 07 90 00.

C. Acoustic Partition Mullion Trim Cap [09 21 16.MTC]:
1. Products:
a. Mull-It-Over; 60 Classic Sound Barrier Mullion Trim Cap.
b. Gordon; Series 60 Mullion Mate with Mullion Mate End Cap.
2. Finish: Custom color selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions and substrates are appropriate for work of this section to commence.

B. Coordinate installation of anchorage devices for suspended ceilings/soffits, verifying that spacing and rated strength are correct for anticipated load conditions.

3.02 FRAMING INSTALLATION

A. Comply with ASTM C754 and manufacturer's instructions.

B. Fire-rated assemblies: Comply with requirements of tested assemblies.

C. Studs:
   1. Extend partitions to structure unless otherwise indicated.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
   4. Slab Deflection: At fire-rated partitions, construct slip-joint head in accordance with UL-witnessed reports and manufacturer's recommendations.

D. Partition heights:
   1. Where not indicated otherwise, extend partitions from floor to underside of solid structure above.
   2. Where indicated, extend partitions to underside of suspended ceiling or to just above suspended ceiling, as indicated.
      a. Brace partial height partitions in accordance with design requirements specified in Part 1 of this Section.
   3. Blocking and bracing: Install blocking and bracing as recommended by manufacturer for adequate support of wall-mounted items installed as work of other sections.

E. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double 20 gauge, 0.036 inch (0.91 mm), side-by-side studs at jambs on both sides of opening.
   1. At openings in fire rated partitions, comply with requirements of governing authorities for framing.

F. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
   1. Orientation on solid walls: Vertical.

G. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, shelving, and other fixture mounted on partitions. Screw steel blocking channels to studs.

H. Suspended Ceilings and Soffits:
   1. Secure hangers to structure or to anchorage devices so that full strength of hanger can be achieved.
      a. Install ceiling channels at spacing indicated or required, but not greater than permitted by ASTM C754.
      b. Secure furring members to ceiling channels by means of clips or wire ties.
   2. Level ceiling system to a tolerance of 1/8 inch (3 mm) in 12 feet (3.65 m), or to a higher tolerance if required by specific project conditions.
   3. Level soffits to a tolerance of 1/8 inch (3 mm) in 12 feet (3.65 m), or to a higher tolerance if required by specific project conditions.

4. Reinforce openings and interruptions in horizontal framing system with additional furring channels. Ensure that entire suspension system is laterally braced.

3.03 ACOUSTIC INSULATION

A. Acoustic Insulation: After gypsum board has been installed on one side, place insulation tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions. Fill cavities completely, using recommendations and details indicated in USG Corporation's "Gypsum Construction Handbook".

3.04 NOISE, AIR, AND DUST CONTROL

A. General: Every partition dividing two spaces is a noise, air, and dust control partition.
   1. Seal noise, air, and dust control partitions in accordance with the requirements listed below.
   2. Seal gypsum panels used on the interior face of exterior walls in the same manner.
   3. Seal gypsum furring panels used on masonry in the same manner.

B. Seal perimeter of partition with acoustical sealant, complying with recommendations and details in USG Corporation's "Gypsum Construction Handbook" and ASTM C919. Do not install sealant under metal runners. Install 1/4 inch (6 mm) or larger round bead of sealant to in-place runners and adjacent substrate including those used at partition intersections. Immediately place gypsum panel so as to compress bead, leaving 1/8 inch (3 mm) of perimeter relief (or other dimension where indicated) between gypsum panel and adjacent construction. Locate the sealant bead so that the bead seals between the gypsum wallboard, the runner, and the adjacent floor, wall, structure, or other substrate.
   1. Relief Joints: Install sealant between metal edge trim and adjacent construction. Joint size 1/4 inch (6 mm) unless otherwise indicated.
   2. Install sealant beneath control joints.
   3. Install sealant at metal door frames just before inserting face panel.
   4. Carefully seal around penetrations such as electrical boxes, plumbing, cabinets, ducts, and other openings.

3.05 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C840 and manufacturer's instructions.. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-rated assemblies: Comply with requirements of tested assemblies.

C. Apply ceiling boards prior to installation of wallboards. Arrange to minimize butt end joints near center of ceiling area.

D. Install wallboards in a manner which will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls.

E. Butt all joints loosely, with maximum of 1/16 inch (1.5 mm) between boards.

F. Size panels to provide perimeter relief and install over sealant as specified under noise control, above. Do not install panels unless and until sealant is properly installed.

G. Place wrapped edges adjacent to one another; do not place cut edges or butt ends adjacent to wrapped edges.

H. Support all edges and ends of each board on framing or by solid substrate, except that long edges at right angles to framing members in non-fire-rated construction may be left unsupported.

I. Install gypsum board by means of screw attachment.

J. Single-Layer: Install gypsum board vertically, with ends and edges occurring over firm bearing.
   1. On walls and partitions, plan installation so that the leading edge or end of gypsum board is attached to open end of stud flange first.

K. Double-Layer Installation: Use gypsum backing board or gypsum wallboard for first layer, placed perpendicular to framing or furring members. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
   1. In ceiling work, install base layer with long edges perpendicular to framing members, with face layer in opposite direction, and with all joints offset.
   2. In wall work, install base layer with long edges parallel to framing members with face layer in opposite direction, and with all joints offset.
   3. Install face layer by means of screws at least 3/8 inch (10 mm) longer than total thickness of gypsum board layers, spaced as specified for the tested assembly.

L. Impact-Resistant Gypsum Wallboard: Install at rooms indicated in Drawings.

M. Glass Mat Faced Gypsum Backing Board:
   1. Install water-resistant backing board on partitions to receive tile.
   2. Butt joints together with 1/8 inch (3 mm) space at joints. Layout work and use appropriate length material to avoid end joints. Joints shall occur over framing members. Stagger end joints between adjacent panels.
   3. Place uncoated rear face against studs, so that coated front face will receive tile or other finish.
   4. Fit panels snugly around penetrations and openings.
   5. Drive fasteners tight against and flush with panel surface. Do not countersink fasteners.
   6. Locate fasteners not closer than 3/8 inch (10 mm) from edge and ends of panels.
   7. Space fasteners at not more than 8 inches (200 mm) on center at perimeter and field, unless closer spacing is indicated on the drawings.

3.06 SHAFT WALL INSTALLATION

A. Comply with manufacturer's printed installation instructions, standard details, and recommendations.

B. Metal Perimeter Framing:
   1. Accurately position runners at floor and ceiling, with short leg to finish room side.
   2. Attach runners to structure with appropriate power-driven fasteners, spaced at not more than 24 inches (600 mm) on center.
   3. Install metal studs, struts, or vertical runners as recommended by manufacturer at intersection of shaftwall and structural framing, at corners and T-shaped intersections, and at openings.

C. Shaft Wall Liner:
   1. Cut liner panels accurately to a dimension 3/4 to 1 inch (19 to 25 mm) less than wall height. Install sequentially between special metal studs designed to hold liner panels by friction at shaft side of wall.
   2. On walls over 16 feet (4.8 m) in height, screw-attach studs to runners top and bottom.
   3. When maximum panel length available is less than shaftwall height, position horizontal joint within top third and bottom third of wall, alternating location at adjacent panels.

D. Door Openings:
   1. Comply with manufacturer's details for installation of minimum 20 gauge, 0.036 inch (0.91 mm) metal struts or studs at head and jambs. Spot grout one-piece metal frames after liner panels have been installed.
   2. Support elevator door frames, accessories, and operating mechanisms independently of gypsum board shaftwall system.

E. Boxes and Recessed Accessories: Maintain fire separation at openings by adding protection behind recessed components in accordance with manufacturer's details for tested assemblies.

F. Structural Support: Provide supplemental blocking, framing, furring, and reinforcement as recommended by manufacturer and as required to properly support elements attached to non-load bearing shaftwall system.

3.07 INSTALLATION OF TRIM AND ACCESSORIES

A. Comply with manufacturer's recommendations for installation of trim items. Except for items intended by manufacturer to be left exposed or semi-exposed, install trim units for concealment in joint finishing compound. Wherever possible, fasten metal trim items to substrate with same fasteners used to install gypsum board products.

B. Control Joints: Where control joints are indicated on the drawings, place control joints as shown on the drawings. Where control joints are not indicated on the drawings, place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
   2. Install one-piece control joints at required locations. Do not remove tape until finishing operations are complete.

C. Corner Beads: Install at external corners, unless details clearly indicate its omission at specific locations. Use longest practical lengths.

D. Isolation Joints: Where gypsum board construction abuts cabinetry, windows, structural components, and other dissimilar materials, provide isolation by stopping board a minimum of 1/4 inch (6 mm) from structure, for finishing by means of exposed or semi-exposed trim.

E. Aluminum Trim: Install as indicated on drawings and in accordance with manufacturer's instructions.

3.08 JOINT TREATMENT AND FINISHING OF SURFACES TO RECEIVE HIGH PERFORMANCE COATINGS

A. Ordinary GWB plus Setting Type Joint Compound:
   1. Provide joint treatment using setting type compound, mesh or paper joint tape recommended by joint compound manufacturer, and Finish Level 4 as specified below for "all other surfaces".

3.09 JOINT TREATMENT - ALL OTHER SURFACES

A. Where installation of "pre-rock" board is permitted before the building is fully enclosed, do not perform joint treatment until the building is fully enclosed and the interior environmental conditions are stable and are as recommended by the wallboard manufacturer.

B. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C840.

C. Do not mix joint compounds except as specifically recommended by manufacturer.

D. Joint Treatment for Glass Mat Faced Gypsum Backing Board to Receive Tile:
   1. At corners install a bead of urethane joint sealant to seal the corner.
   2. Fill joints between backing boards with tile setting mortar.
   3. Apply self-adhering fiberglass sheathing tape to all joints, corners, and openings; overlap tape intersections for a width equal to tape width.
   4. Embed tape in tile setting material.
   5. Allow joints to dry before proceeding with tile installation.

E. Penetrations in Wallboard: Fill cutouts and openings around fixtures and penetrations with joint compound.

F. Penetrations in Gypsum Backing Board: Seal cut edges with elastomeric sealant specified in Division 07.

3.10 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.11 CLEANING

A. Promptly remove any residual gypsum drywall materials from adjacent or adjoining surfaces, leaving spaces ready for subsequent finishing operations and decorating.

3.12 FINISH LEVEL SCHEDULE - ALL OTHER SURFACES

A. Level 1: Above finished ceilings concealed from view; from 8 inches (200 mm) above suspended ceilings to top of partition.
   1. Embed tape in joint compound at all joints and interior angles; provide accessories only as detailed.
   2. Provide surfaces free of excess joint compound; tool marks and ridges are acceptable.

B. Level 2: Walls scheduled to receive the following:
   1. Utility areas; areas behind cabinetry.
   2. Application:
      a. Embed tape in joint compound at all joints and interior angles.
      b. Provide one separate coat of compound at all joints, angles, fastener heads, and accessories.
      c. Provide surfaces free of excess joint compound; tool marks and ridges are acceptable.

C. Level 4: Surfaces scheduled to receive the following:
   1. Flat or eggshell paint finish specified in Section 09 91 00 - Paints and Coatings.
   2. All surfaces not otherwise indicated.
   3. Application:
      a. Embed tape in joint compound at all joints and interior angles.
      b. Provide three separate coats of compound at all joints, angles, fastener heads, and accessories.
      c. Provide smooth surfaces free of tool marks and ridges.

D. Level 5: Walls and/or ceilings scheduled to receive the following:
   1. Semi-gloss or gloss paint finish specified in Section 09 91 00 - Paints and Coatings.
   2. Waterborne epoxy coatings specified in Section 09 96 00 - High Performance Coatings.
   3. Wallcovering specified in Section 10 11 46 - Visual Display Fabrics and 10 11 47 - Tackable Wallcovering.
   4. Architectural graphic film specified in Section 08 87 00 - Architectural Graphic Film.
   5. Where indicated in Drawings.
   6. Application:
      a. Embed tape in joint compound at all joints and interior angles.
      b. Provide three separate coats of compound at all joints, angles, fastener heads, and accessories.
      c. Apply a thin skim coat of joint compound or a special-purpose coating to the entire gypsum board surface.
      d. Provide smooth surfaces free of tool marks and ridges.

E. Additional Finishing Requirements for all "pre-rock" board: Apply an additional full skim coat to the surface in accordance with wallboard manufacturer's written recommendations.
   1. Where a Level 4 Finish is specified, perform all steps to achieve a Level 4 Finish, then install a full skim coat to the surface.
   2. Where a Level 5 Finish is specified, perform all steps to achieve a Level 5 Finish.

F. Finishing Glass Mat Faced Gypsum Backing Board to Receive Tile: As specified under "Joint Treatment", above.

END OF SECTION

SECTION 09 27 00 - PLASTER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass-fiber-reinforced gypsum fabrications as indicated on drawings.
   1. Interior column covers.

1.02 REFERENCE STANDARDS

A. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

B. ASTM C1355/C1355M - Standard Specification for Glass Fiber Reinforced Gypsum Composites; 1996 (Reapproved 2020).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including dimensions, finishes, storage and handling requirements and recommendations, and installation recommendations.

B. Shop Drawings: For custom items, provide drawings showing dimensions, layout, joints, details, fastening, and interface with adjacent work; include field measured dimensions of the spaces where items are to be installed, if critical to proper installation.

C. Samples: For each custom finish specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass-Fiber-Reinforced Gypsum Fabrications:
   1. Advanced Architectural Stone: www.advancedarchitecturalstone.com.
   2. Castle Access Panels & Forms Inc: www.castleaccesspanels.com.
   3. Hyde Park Mouldings, Inc: www.hyde-park.com.
   4. IntexForms, Inc: www.intexforms.com.

2.02 GYPSUM FABRICATIONS (INTERIOR USE ONLY)

A. Glass-Fiber-Reinforced Gypsum Fabrications: Molded glass fiber reinforced gypsum with structural reinforcing as required, in configurations indicated on Drawings.
   1. Surface Burning Characteristics: Flame spread index of 0 (zero), smoke developed index of 10, maximum, when tested in accordance with ASTM E84.
   2. Surface Finish: Suitable for flat paint finish, without pinholes , voids, or roughness..
   3. Material Characteristics: Complying with ASTM C1355/C1355M.
   4. Glass Content: Minimum 5 percent by weight.
   5. Method of Construction: Hand or spray lay-up process in molds.
   6. Shell Thickness: 3/16 inch (5 mm), minimum.
   7. Shell Thickness at Part Edges and at Fastening Points: 5/16 inch (8 mm), minimum.
   8. Outside Corner Radius: 1/8 inch (3 mm), maximum.
   9. Draft Angle: 3 degrees, minimum, on returns, setbacks, reveals, and grooves.
   10. Dimensional Tolerances of Molded Surfaces:
      a. Straightness: Maximum of 1/8 inch in 8 linear feet (1 mm in 750 mm) variation from straight at any point along any plane, edge, or surface.
      b. Overall Width and Length: Plus/minus 1/8 inch (3 mm).
      c. Dimensions Within Overall Width and Length: Plus/minus 1/16 inch (2 mm).

B. Joint Cement: Type recommended by fabrication manufacturer.

C. Joint Tape and Compound: Types recommended for gypsum wallboard work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect and wait for instructions before beginning installation.

3.02 INSTALLATION

A. Install in accordance with applicable code and manufacturer's recommendations, plumb and true to line; shim where necessary.

B. Coordinate work with installation of substrates.

C. Join pieces with cemented butt joints except at control and expansion joints.

D. Provide control joints at not more than 35 feet (10.5 m) on center if not indicated on drawings.

E. Finish joints and surfaces as required for Level 5 in ASTM C840.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Final Acceptance.

END OF SECTION

SECTION 09 30 00 - TILING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Tile.
   2. Tile setting materials.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.

B. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

C. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.

E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2021.

1.03 SUBMITTALS

A. Product Data:
   1. Written product information which demonstrates materials to be used on the project comply with contract documents.
   2. Manufacturer's installation instructions.

B. Samples for Verification Purposes: Submit the following:
   1. Submit each tile type selected mounted on a minimum 12 inches (305 mm) square board with joints filled using selected grout.

1.04 QUALITY ASSURANCE

A. Material Source: Furnish each type, finish, and color of tile product and accessory materials from a single supplier.

B. Tile Work Mock-up: To establish an acceptable standard of quality for comparison during installation, as well as to verify types of materials submitted, construct a 4 x 4 feet (1.2 x 1.2 m) mock-up for each tile type, setting materials, and grout.
   1. Locate mock-ups as instructed by the Architect.
   2. Do not start installation work until Architect accepts mock-ups.
   3. After installation and when directed by Architect, remove mock-ups from project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store tile products and setting materials in manufacturer's sealed packages. Protect material from damage and store in dry location.

1.06 PROJECT CONDITIONS

A. Provide temperatures in tiled areas during installation and after completion as required by referenced installation standard or manufacturer's instructions, but not less than 50 deg F (10 deg C).

B. If necessary to use temporary heaters, vent units to exterior to protect tile work from carbon dioxide accumulation.

1.07 MAINTENANCE MATERIALS

A. Extra Materials: Deliver supply of maintenance materials to the Owner. Furnish maintenance materials from same lot as materials installed, and enclosed in protective packaging with appropriate identifying labels.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, but no less than one carton, for each type, composition, color, pattern, and size.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Substainability Requirements:
   1. Provide adhesives complying with South Coast Rule No. 1168 by the South Coast Air Quality Management District.
      a. Ceramic Tile Adhesives: 65 g/l.

2.02 MATERIALS - GENERAL

A. Ceramic Tile Standard: ANSI A137.1. Tile grade: "Standard Grade," unless noted otherwise.

B. Tile Installation Materials Standard: ANSI standard referenced for setting and grouting materials.

C. Colors, Textures, and Patterns, Tile, Grout, and Other Products: Match colors indicated or as scheduled on drawings.

D. Color Blending: Factory-blend tile products which have a natural color range so products taken from one box will have the same range as products from a separate box.

E. Tile Mounting: Manufacturer's standard factory back- or edge-mounting.

2.03 TILE MATERIALS

A. Tile Type 1 (09 30 00.T1):
   1. Basis of Design Manufacturer: Best Tile; Step In.
      a. Contact: Nancy Peters, npeters@besttile.com, 919.986.6256.
   2. Color: Grey.
   3. Finish: Matte.
   4. Size: 12" x 24" rectified.
   5. Other Acceptable Manufacturers and Patterns:
      a. RocaTile; Abaco, Grafito, 12” x 24” Rectified.
      b. Daltile; Portfolio, PF05 Ash Grey, 12” x 24”, Rectified.

B. Tile Type 2 (09 30 00.T2):
   1. Basis of Design Manufacturer: Best Tile; Step In.
      a. Contact: Nancy Peters, npeters@besttile.com, 919.986.6256.
   2. Color: Grey.
   3. Finish: Matte.
   4. Size: 6" x 24" cut from 12" x 24" rectified; factory edge installed as top edge.
      a. Schluter Jolly trim installed on top edge. Brushed nickel anodized aluminum.
   5. Other Acceptable Manufacturers and Patterns:
      a. Roca Tile USA; Abaco, Grafito.
      b. Daltile; Portfolio, PF05 Ash Grey.

C. Tile Type 3 (09 30 00.T3):
   1. Basis of Design Manufacturer: Best Tile; Ocean Blue.
      a. Contact: Nancy Peters, npeters@besttile.com, 919.986.6256.
   2. Color: Blue.
   3. Finish: Polished.
   4. Size: 12" x 24" rectified.
   5. Install: Vertical stack bond.
   6. Other Acceptable Manufacturers and Patterns:
      a. Dal-Tile, Elysium, Calacatta Blue, 12” x 24” Rectified, Polished.
      b. Soho Studios; Calacatta Azul, 12”x 24” Rectified, Polished.

D. Tile Type 4 (09 30 00.T4):
   1. Basis of Design Manufacturer: Stone Peak; Ocean Blue.
      a. Contact: Nancy Peters, npeters@besttile.com, 919.986.6256.
   2. Pattern: Ocean.
   3. Finish: Glossy.
   4. Size: 4" x 12".
   5. Install: Horizontal stack bond.
   6. Other Acceptable Manufacturers and Patterns:
      a. Specialty Tile; Glow, Color: Ocean, 4” x 12”, Glossy.
      b. Emser Tile; Ombre Blue, 4” x 12”, Glossy.

E. Tile Type 5 (09 30 00.T5):
   1. Basis of Design Manufacturer: Stone Peak; Ocean Blue.
      a. Contact: Nancy Peters, npeters@besttile.com, 919.986.6256.
   2. Pattern: Ocean.
   3. Finish: Glossy.
   4. Size: 8" x 24".
   5. Install: Horizontal stack bond.
   6. Other Acceptable Manufacturers and Patterns:
      a. Specialty Tile; Glow, Color: Ocean, 8” x 12”, Glossy.
      b. Emser Tile; Ombre Blue, 8” x 24”, Glossy.

2.04 THRESHOLDS AND TRANSITIONS

A. General:
   1. Fabricate to size to provide transition between tile floor and adjacent floor surface.
   2. At door openings, install a single full-width piece; notch threshold to door jamb profile.

B. Products: Refer to Section 09 60 10 - Flooring Transitions.

2.05 SETTING, GROUTING, AND WATERPROOFING MATERIAL MANUFACTURERS:

A. Provide products of a single manufacturer, unless otherwise specified, required, and approved.

B. Manufacturers:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corporation.

2.06 SETTING MATERIALS

A. Latex-Portland Cement Mortar: Two-component, dry mortar mix and liquid latex additive, field-mixed; complying with ANSI A118.15.
   1. All components premeasured and prepackaged.
   2. Liquid latex additive: Acrylic or styrene-butadiene resin water emulsion.
   3. Mix in accordance with manufacturer's recommendations.
   4. "ProLite Thin Set Mortar"; Custom Building Products.
   5. "255 MultiMax Thin Set Mortar"; Laticrete International, Inc.
   6. "UltraLite Thin Set Mortar"; Mapei Corporation.

2.07 GROUTING MATERIALS

A. Chemical-Resistant, Water-Cleanable Ceramic Tile Setting and Grouting Epoxy: ANSI A118.3.
   1. "CEG-Lite 100% Solids Epoxy Grout"; Custom Building Products.
   2. "SpectraLock Pro Grout"; Laticrete International, Inc.
   3. "Kerapoxy"; Mapei Corporation.

B. Grout Color: Using brand-name products specified above, provide grout matching the color selected by the Architect. Brand names/colors indicated on the finish schedule or plans, if any, denote color, only, not product.

2.08 PATCHING AND LEVELING COMPOUND

A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.

B. Have not less than the following physical properties:
   1. Compressive strength - 3500 psi (24.13 MPa).
   2. Tensile strength - 1000 psi (7 MPa).
   3. Flexural strength - 1000 psi (7 MPa).

C. Capable of being applied in layers up to 2 inches (50 mm) thick, being brought to a feather edge, and being troweled to a smooth finish.

D. Ready for use in 48 hours after application.

2.09 MISCELLANEOUS MATERIALS

A. Tile Cleaner: Acidic tile cleaners are not acceptable. Provide products specifically recommended by grout manufacturer for type of grout and tile used, such as the following:
   1. Commercial detergent or tri-sodium phosphate.
   2. Dry grout powder.
   3. Methyl alcohol.

B. Edge Trim:
   1. Schluter JOLLY-J 100 EB.
   2. Material: Brushed stainless steel.

C. Joint Sealant: Specified in Division 07. Color shall match adjacent grout unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify with the installer that substrate areas where tile is to be installed have been prepared correctly, and that all backing materials have been installed. Correct unacceptable conditions before start of tile work.

B. Verify that concrete substrates have not been cured with membrane-forming curing compounds. The following types of curing are suitable to receive tile or bonded mortar beds:
   1. Continuous moist curing methods.
   2. Moisture-retaining sheet materials.
   3. Chemical hardening type curing compounds.
   4. Membrane-forming curing compounds are acceptable only where thick-bed with cleavage membrane will be installed.

C. Correct unsuitable substrates before proceeding.

3.02 PREPARATION

A. Factory-Blending: Before start of installation verify that tile with an anticipated range of colors has been correctly blended to achieve a uniform color range from tile package to tile package.

B. Patching and Leveling:
   1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
   2. Fill holes and cracks and level concrete floors that are out of required plane with patching and leveling compound.
   3. Thickness of compound shall be as required to bring finish tile system to elevation shown.

C. Floors:
   1. Membrane-forming curing compounds, if used, shall be completely removed by abrasive blast cleaning, vigorous wire brushing, or scarifying. Acid cleaning is not acceptable, unless specifically approved by the Architect.

D. Walls:

1. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
2. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry, that are out of required plane.

3.03 INSTALLATION - GENERAL

A. Tile Installation Standard:
   1. ANSI A108/A118/A136 series, for setting and grouting materials listed.
   2. Comply with TCNA (HB) "Handbood for Ceramic Tile Installation" for type of applications indicated.

B. Set tile firmly in place with finish surfaces in true planes.
   1. Seal tile joints water tight around electrical outlets, piping fixtures, and fittings before cover plates and escutcheons are set in place.
   2. Completed work shall be free from:
      a. Hollow sounding areas.
      b. Loose or cracked or scratched tile.
      c. Out of plane or misaligned tile.
      d. Mismatched patterns or colors.
      e. Grout haze or other stains.
      f. Other defects.

C. Install tile under or behind equipment and fixtures.

D. Carefully cut, drill, and grind tile to fit around items projecting through tile surface, so that escutcheons or cover plates conceal cut edges, and without marring tile surface.

E. Joint Patterns: Lay out tile according to patterns indicated on drawings, or if not shown, in a grid pattern with floor joints aligning with wall and trim joints. Install joints straight and of uniform width. Neatly form intersections and returns.
   1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
   2. Joint size, unless otherwise indicated:
      a. Wall and floor tile: 1/16 inch (1.5 mm).

F. Sealant-Filled Joints: Install joints in the locations listed below, and elsewhere indicated on the drawings. Saw-cut joints are unacceptable. Joint installation method: TCA EJ 171.
   1. Between floor tile and base tile or other hard finish material at walls, curbs, columns, pipes, and similar conditions.
   2. Where changes occur in floor or wall substrates. Locate joint in tile directly over joint in substrate.
   3. Where control, construction, or cold joints occur in floor or wall substrates. Locate joint in tile directly over joint in substrate.

G. Remove and reset defective work.

3.04 TRIM

A. Metal Transition Trim: Install metal edge strips in floor joints between tile floors and adjacent flooring or other materials where the finish floors are flush. Thick-set edge strip in mortar bed to line and level, and centered under doors or in openings.

B. Edge Trim: Install edge trim where indicated on Drawings.

3.05 TILE APPLICATIONS

A. Application 09 30 00.HLE: Horizontal tile, latex mortar; epoxy grout, TCNA F115.
   1. Bond coat: Latex-Portland cement mortar, ANSI A108.5.
   2. Grout: Epoxy, ANSI A108.6.

B. Application 09 30 00.VLE: Vertical tile, latex mortar, epoxy grout: TCNA W202E/W202I//W245.
   1. High performance gypsum backing board on walls: Specified Section 09 21 16 - GYPSUM BOARD ASSEMBLIES.

2. Bond coat: Latex-Portland cement mortar, ANSI A108.5.
3. Grout: Epoxy, ANSI A108.6.

3.06 SEALING OF JOINTS

A. Rake out joints for installation of sealant specified elsewhere.
   1. At thin-set assemblies, rake out joint full depth of tile.
B. Install sealant in accordance with requirements specified elsewhere.

3.07 CLEANING AND PROTECTION

A. Clean tile surfaces after installation is complete.
   1. Remove grout residue from tile as soon as possible after tile installation and in strict accordance with manufacturer's instructions.
   2. Tile that is stained or which contains grout haze after cleaning will be considered defective, and shall be removed and replaced with new tile at no cost to the Owner.
B. Replace any broken, chipped, marred, or otherwise damaged tile before final acceptance.
C. Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with kraft paper for protection from subsequent construction activities.
D. Do not allow any traffic on completed tile floors for minimum 7 days after completion.
E. Remove protection, rinse, and dry tile installations before final review and acceptance.

END OF SECTION

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Suspended metal grid ceiling system.
   2. Acoustical units.
   3. Accessories.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

1.03 SUBMITTALS

A. Product Data: Provide data on suspension system components and acoustical units.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

1.04 PROJECT CONDITIONS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

1.05 MAINTENANCE MATERIALS

A. Acoustical Ceiling Panels: Full-Size panels equal to 5 percent of quantity installed for AC1, ACT2, ACT3.

B. Suspension System Components: Quantity of each exposed component equal to 5 percent of quantity installed.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Acoustical Units (AC1):
   1. Acoustical Panel: Plastic or vinyl-faced mineral fiber, ASTM E1264, Type IV, Class A, with the following characteristics:
      a. Size: 24 x 24 inches (610 x 610 mm).
      b. Thickness: 7/8 inch.
      c. Light Reflectance: 0.87.
      d. Noise Reduction Coefficient (NRC): 0.80.
      e. Ceiling Attenuation Class (CAC): 35.
   2. Products:
      a. Armstrong (Basis of Design):
         1) Acoustical Panel: Armstrong; Ultima High NRC, beveled tegular edge.
         2) Suspension System: Prelude XL 15/16 Heavy Duty.
      b. CertainTeed:
         1) Acoustical Panel: Certainteed; Symphony m.
         2) Suspension System: 15/16” Reveal Corner Bevel EX Stab Classic.
      c. USG:
         1) Acoustical Panel: USG; Mars.
         2) Suspension System: USG DX.

B. Acoustical Units (AC2):
   1. Acoustical Panel: Plastic or vinyl-faced mineral fiber, ASTM E1264, Type IV, Class A, with the following characteristics:
      a. Size: 24 x 24 inches (610 x 610 mm).
      b. Thickness: 7/8 inch.
      c. Light Reflectance: 0.86.
      d. Noise Reduction Coefficient (NRC): 0.80.
      e. Ceiling Attenuation Class (CAC): 35.
   2. Products:
      a. Armstrong (Basis of Design):
         1) Acoustical Panel: Ultima Health Zone, square edge.
         2) Suspension System: Prelude XL 15/16 Heavy Duty.
      b. CertainTeed:
         1) Acoustical Panel: Certainteed; Symphony f Rx.
         2) Suspension System: 15/16” EZ Stab Classic.
      c. USG:
         1) Acoustical Panel: USG; Mars Healthzone.
         2) Suspension System: USG DXLA.

C. Acoustical Units (AC3):
   1. Acoustical Panel:
      a. Size: 24 x 72 inches (610 x 1828 mm).
      b. Thickness: 1 1/2 inch.
      c. Noise Reduction Coefficient (NRC): 0.90.
   2. Products:
      a. Rockfon (Basis of Design):
         1) Acoustical Panel: Spanair Metal Panel, Torsion Spring.
            (a) Color: White (01).
            (b) Perforation pattern: E, #71R138D .
            (c) Accessories: 1-1/2" acoustical pads.
         2) Suspension System: Manufacturer's recommended system.
      b. Armstrong:
         1) Acoustical Panel: Metalworks Torsion Spring System.
            (a) Color: White.
            (b) Perforation pattern: M15.
            (c) Accessories: 1-1/2" fiberglass infill.
         2) Suspension System: Manufacturer's recommended system.
      c. CertainTeed:
         1) Acoustical Panel:
            (a) Color: White.
            (b) Perforation patter: 132.
            (c) Accessories: 1-1/2" acoustic backer.
         2) Suspension System: Manufacturer's recommended system.

2.02 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
   2. Extruded Aluminum Perimeter Trim [EPT]: Size and configuration indicated on the Drawings.
      a. "Compasso Elite"; USG.
      b. "Axiom Classic Perimeter Trim"; Armstrong.
      c. "Cloud Perimeter Trim"; CertainTeed.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:240.

C. Locate system on room axis according to reflected plan.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners in excess of 2 degrees.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to shortest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges with manufacturer's recommended paint.

H. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 09 54 26 - SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood grilles.

B. Metal suspension system.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

F. CISCA (WC) - Wood Ceilings Technical Guidelines; 2009.

1.03 SUBMITTALS

A. Shop Drawings: Indicate grid layout and related dimensioning, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

B. Product Data: Provide data on wood ceiling components and suspension system components.

C. Samples: Submit three full size samples illustrating material and finish of wood ceiling components.

D. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for fire and acoustical performance.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Suspended Wood Ceilings:
   1. 9Wood: www.9wood.com.
   2. ASI Architectural: www.asiarchitectural.com.
   3. Rulon International: www.rulonco.com.

2.02 SUSPENDED WOOD SLAT CEILING SYSTEM (WSC)

A. Performance Requirements:
   1. Design for maximum deflection of 1/360 of span.
   2. Surface Burning Characteristics: Flame spread index of 26-75, smoke developed index of 0-450, when tested in accordance with ASTM E84.

B. Wood Grilles: Pre-assembled module of solid wood grilles with battens.
   1. Module Size: 24 by 24 inches (610 by 610 mm), nominal, as indicated in Drawings.
   2. Grille Size: 3/4 inch (17 mm) width by 2 1/4 inch (57 mm) depth.
   3. Grille Spacing (Reveal): 2 inch (51 mm).
   4. Vertical rail orientation.
   5. Acoustical Backer: Fiberglass, 1 inch (25 mm) thick.
      a. Color: Black.

6. Solid Wood Species: Poplar or Western Hemlock.
   a. Factory Finish: Custom wood stain to match Architect's sample, clear sealer top coat.
7. Attachment to Suspension Grid: Lay-in.
8. Suspension System: Type specified below.
9. Products:
   a. Basis of Design: Rulon; Panel Grille - InTEGrille, PGT 6-12-37 DW: www.rulonco.com.
   b. 9Wood; 1300 Lay-in Grille: www.9wood.com.
   c. ASI Architectural; Grille Tegular, 2 inch spacing on center: www.asiarchitectural.com.

C. Metal Suspension System:
1. General: Comply with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   a. Materials:
      1) Aluminum Grid: Aluminum sheet, ASTM B209/B209M.
2. Concealed Ceiling Suspension System: Aluminum grid.
   a. Description: Engineered grid, with slotted faces in main tees, cross tees, hangers, trim molding, load resisting struts, hinge assemblies, and other suspension components required to support ceiling and other ceiling supported construction. Panels installed from below by inserting torsion springs into slots in faces of main tees of ceiling grid.
   b. Application(s): Downward access.
   c. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
   d. Profile: Flat.
   e. Finish: Powder coat.
   f. Color: Black.
3. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement.

D. Accessories: Manufacturer's standard accessories for installation method indicated, above-ceiling accessibility.

2.03 FABRICATION

A. Shop fabricate wood ceiling components to the greatest extent possible.

B. Fabricate components to allow access to ceiling plenum as required.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install suspended wood ceiling system in accordance with CISCA (WC).

B. Suspension System:
1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
6. Do not eccentrically load system or induce rotation of runners.

C. Wood Ceiling:

1. Install wood ceilings in accordance with manufacturer's instructions.
2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
3. Install components in uniform plane, and free from twist, warp, and dents.
4. Cut to fit irregular grid and perimeter edge trim.
5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.
6. Install acoustical backer above wood ceiling components; fit tight between grid members.

3.02 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 09 60 10 - FLOORING TRANSITIONS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C503/C503M - Standard Specification for Marble Dimension Stone; 2015.

1.02 SUBMITTALS

A. Product Data.

B. Verification Samples: Submit three samples, 6 by 6 inch (150 by 150 mm) inch in size illustrating color and pattern for each product specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: As listed in the schedule, below.

B. Other Acceptable Manufacturers, Metal:
1. Blanke International; https://www.blankecorp.com/blanke-usa/
2. Ceramic Tool Company; https://www.ceramictool.com/index.html
3. Tredsafe; https://tredsafe.com/
4. National Metal Shapes, Inc.; https://www.nationalmetalshapes.com/

C. Other Acceptable Manufacturers, Resilient:
1. Roppe; https://roppe.com/
2. Mannington Commercial; https://www.manningtoncommercial.com/products/accessories/moldings-and-finishings/

	CARPET	TERRAZZO	RESILIENT FLOORING		TILE - AT DOOR		RESINOUS FLOORING	EXPOSED CONCRETE
CARPET	N							
TERRAZZO	A	M						
RESILIENT	C	B	N					
TILE - AT DOOR	L	L	B		L			
RESINOUS FLOORING	N	N	B		N		M	
EXPOSED CONCRETE	F	E	F		N		B	N

DESCRIPTION

A Metal Schluter Reno-TK, Size appropriate for material thicknesses.

B Metal Schluter-Reno-U, Size appropriate for material thicknesses.

C Metal Schluter-SCHIENE, Size appropriate for material thicknesses.

E Metal Schluter-RENO-RAMP, Size appropriate for material thicknesses.

F Resilient Johnsonite EG-XX-H, 0 to 1/4 inch (0 to 6 mm)

L Marble: ASTM C503/C503M. White, honed marble; Marble Institute of America Group "A".

M Divider Strips: 1/8 inch (3 mm) thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

N No Transition Required or Not Used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate and install transitions between each type of flooring in accordance with the table above and the respective flooring specifications.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
      a. Luxury vinyl tile.
      b. Rubber tile.
   2. Resilient stair covering.
      a. Treads.
      b. Risers.
      c. Stringers.
   3. Resilient base.
   4. Installation accessories.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

C. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

D. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2017).

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

B. Test Reports: See requirements specified in Section 09 05 61 - Preparation of Concrete to Receive Adhesively Installed Flooring.

C. Verification Samples: Submit three samples, 6 by 6 inch (150 by 150 mm) in size illustrating color and pattern for each product specified.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 deg F and 90 deg F (13 deg C and 32 deg C).

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 deg F (21 deg C) to achieve temperature stability. Thereafter, maintain conditions above 55 deg F (13 deg C).

1.05 MAINTENANCE MATERIALS

A. Resilient Tile and Rubber Fooring: Provide 5 percent of installed resilient product, but not less than one carton, of each type and color specified.

B. Resilient Base: Provide not less than 25 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size

PART 2 PRODUCTS.

2.01 MATERIALS - TILE FLOORING

A. Manufacturers: Contractor shall provide products specified below from a single manufacturer for all types of luxury vinyl tile.

B. Luxury Vinyl Tile 1 (LVT1):
   1. Size: 12 x 24 inches (305 x 610 mm).

2. Thickness: 0.16 inch (4 mm).
3. Wear layer: 20 mil (0.5 mm).
4. Installation Method: Full coverage glue down.
5. Products:
    a. Basis of Design:
        1) Mannington Commercial; Spacia: www.manningtoncommercial.com.
            (a) Contact: Joyce Cavin, Joyce.cavin@mannington.com, 919.538.1800.
            (b) Pattern: Stone.
            (c) Color: Ceramic Dark.
    b. Other acceptable products:
        1) Tarkett; Even Plane: professionals.tarkett.com.
            (a) Size: 20 inches by 20 inches.
            (b) Thickness: 4.5 mm.
            (c) Pattern: Cement.
            (d) Color: Custom color to match Architect's sample.
        2) Interface; Level Set: www.interface.com.
            (a) Size: 20 inches by 20 inches.
            (b) Thickness: 4.5 mm.
            (c) Pattern: Textured Stones.
            (d) Color: A00309 Medium Concrete.

C. Luxury Vinyl Tile 2 (LVT2):
1. Size: 12 x 24 inches (305 x 610 mm).
2. Thickness: 0.16 inch (4 mm).
3. Wear layer: 20 mil (0.5 mm).
4. Installation Method: Full coverage glue down.
5. Products:
    a. Basis of Design:
        1) Mannington Commercial; Spacia: www.manningtoncommercial.com.
            (a) Contact: Joyce Cavin, Joyce.cavin@mannington.com, 919.538.1800.
            (b) Pattern: Abstract.
            (c) Color: Stellar Ash.
    b. Other acceptable products:
        1) Tarkett; Even Plane: professionals.tarkett.com.
            (a) Size: 20 inches by 20 inches (4.5 mm)
            (b) Thickness: 4.5 mm.
            (c) Pattern: Cement Chevron.
            (d) Color: Custom to match Architect's sample.
        2) Interface; Drawn Lines: www.interface.com.
            (a) Size: 9.5 inches by 40 inches.
            (b) Thickness: 4.5 mm.
            (c) Color: A00909 Diamond.

D. Luxury Vinyl Tile 3 (LVT3):
1. Size: 7.25 x 48 inches (184 x 122 mm).
2. Thickness: 0.20 inch (5 mm).
3. Wear layer: 20 mil (0.5 mm).
4. Installation Method: Full coverage glue down.
5. Products:
    a. Basis of Design:
        1) Mannington Commercial; Uninterrupted: www.manningtoncommercial.com.
            (a) Contact: Joyce Cavin, Joyce.cavin@mannington.com, 919.538.1800.
            (b) Style: Wood.
            (c) Color: Heartwood Oak UN204.
    b. Other acceptable manufacturers:

1) Tarkett; Even Plane: www.tarkett-commercial.com.
   (a) Size: 9.84 inches by 39.3 inches.
   (b) Thickness: 4.5 mm.
   (c) Color: 8708 English Warm GRG.
2) Interface; Level Set: www.interface.com.
   (a) Size: 9.84 inches by 39.38 inches.
   (b) Thickness: 4.5 mm.
   (c) Pattern: Textured Woodgrains.
   (d) Color: A00422 Rustic Hickory.

E. Rubber Tile 1 (RTR1): ASTM F1344, Class I; homogeneous rubber tile with color and pattern throughout thickness.
   1. Total Thickness: 0.125 inch (3.2 mm).
   2. Products:
      a. Flexco; Rubber Floor Tile: www.flexcofloors.com.
         1) Size: 18 x 18 inches (457 x 457 mm).
         2) Color: Match stair treads.
         3) Style: Raised square.
      b. Basis of Design: Johnsonite; Rubber Floor Tile: www.johnsonite.com.
         1) Size: 24 x 24 inches (610 x 610 mm).
         2) Color: Match stair treads.
         3) Style: Raised square.
      c. Roppe; Rubber Floor Tile: www.roppe.com.
         1) Size: 19-11/16 x 19-11/16 inches (500 x 500 mm).
         2) Color: Match stair treads.
         3) Style: Raised square.

F. Rubber Tile 2 (RTR2): ASTM F1344, Class I; homogeneous rubber tile with color and pattern throughout thickness.
   1. Total Thickness: 0.125 inch (3.2 mm).
   2. Products:
      a. Basis of Design: Mainnington Commercial; ColorSpec Rubber Floor Tile: www.manningtoncommercial.com.
         1) Size: 18 1/8 x 18 1/8 inches (460 x 460 mm).
         2) Color: Match stair treads.
         3) Style: Sculptured.
      b. Flexco; SpexTones Rubber Floor Tile: www.flexcofloors.com.
         1) Size: 24 x 24 inches (610 x 610 mm).
         2) Color: Match stair treads.
         3) Style: Hammered.
      c. Roppe; Symmetry Rubber Floor Tile: www.roppe.com.
         1) Size: 19-11/16 x 19-11/16 inches (500 x 500 mm).
         2) Color: Match stair treads.
         3) Style: Hammered.

2.02 MATERIALS - STAIR COVERING

A. Stair Treads and Risers 1 (RST1): ASTM F2169, Type TS Rubber; full width and depth of stair tread and riser in one piece; tapered thickness.
   1. Basis of Design product: Johnsonite; VIRNSQTR, Angle Fit Rubber Stair Treads with Integrated Riser
   2. Nominal Thickness: 0.125 inch (3.2 mm).
   3. Style:
      a. Raised square.
      b. Insert strip: Contrasting color 40 Black.
   4. Flexco Color: 092 Graystone.
   5. Johnsonite Color: 48 Grey.

6. Roppe Color: 123 Charcoal.

B. Stair Treads and Risers 2 (RST2): ASTM F2169, Type TS Rubber; full width and depth of stair tread and riser in one piece; tapered thickness.
   1. Basis of Design product: Mannington Commercial; Connect Step Integrated Tread/Riser with Visual Insert Strip.
   2. Nominal Thickness: 0.125 inch (3.2 mm).
   3. Style:
      a. Sculptured.
      b. Insert strip: Contrasting color Black.
   4. Mannington Commercial Color: ColorSpec, 162 Rain Cloud.
   5. Flexco Color: SpexTones, Nickel with Graphite Linen.
   6. Roppe Color: Symmetry, S174 Smoke.

C. Stair Stringers 1 (RSS1): Full height in one piece and in maximum available lengths, matching treads in material and color.
   1. Basis of Design: Johnsonite; RS-48 Rubber Stringers, 10" high x 6 feet long.
   2. Thickness: 0.080 inch (2 mm).
   3. Color: Match stair treads.

2.03 MATERIALS - BASE

A. Resilient Base: ASTM F1861, Type TS vulcanized thermoset rubber.
   1. Height: 4 inches (102 mm).
   2. Thickness: 0.125 inch (3.2 mm) thick.
   3. Finish: Matte.
   4. Style: Cove.
   5. Length: Roll, 100 - 120 feet (30 - 36.5 m).
   6. Products:
      a. Flexco; Wallflowers: www.flexcofloors.com.
      b. Basis of Design: Johnsonite; Baseworks: www.johnsonite.com.
      c. Roppe Corp; Pinnacle: www.roppe.com.
   7. Color:
      a. RB1: TG3 Iron Mountain.
      b. RB2: 48 Grey.
      c. RB3: 281 Grizzly.

2.04 ACCESSORIES

A. Subfloor Filler: Portland cement-based premix latex; type recommended by flooring manufacturers.

B. Primers and Adhesives:
   1. Provide primers and adhesives as recommended by flooring manufacturer
   2. Where high moisture or pH conditions exist, see additional requirements specified in Section 09 05 61 - Preparation for Adhesively Installed Flooring.
   3. Provide adhesives complying with SCAQMD 1168 Rule.
      a. Rubber Floor Adhesives: 60 g/l.
      b. Vinyl, Linoleum, LVT, and all other Flooring Adhesives: 50 g/l.
      c. Cove Base Adhesives: 50 g/l.

C. Sealer and Wax/Finish Products: Types recommended by flooring manufacturer.

D. Transitions:
   1. Products: Refer to Section 09 60 10 - Flooring Transitions.
   2. Color: Select from manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are smooth and flat within the tolerances specified for that type of work, are free of substances which would impair bonding of adhesive materials, and are ready to receive resilient product.

B. Absorption of Concrete Substrates: Perform water drop test recommended by flooring manufacturer.

C. Verify that concrete subfloor surfaces are ready for resilient flooring installation by testing for moisture and alkalinity as specified in Section 09 05 61 - PREPARATION OF CONCRETE TO RECEIVE ADHESIVELY INSTALLED FLOORING. If test results are not within limits recommended by flooring manufacturer, follow procedures specified in Section 09 05 61.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Where resilient flooring will meet thicker flooring types, provide trowelable underlayment as required to allow for smooth and level flooring transition.

C. Clean substrate.

3.03 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from different containers to ensure shade variations are consistent when tile is placed.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern, unless indicated otherwise in drawings.

F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

G. Install transition strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - STAIR COVERING

A. Install stair coverings in one piece for full width and depth of tread. Adhere over entire surface. Fit accurately and securely.

B. Install stringers configured tightly to stair profile.

3.05 INSTALLATION - BASE

A. Cut vertical joints and fit tightly. Maintain minimum dimension of 18 inches (460 mm) between joints.

B. At external corners, v-cut back of base strip to two-thirds of its thickness and fold.

C. Miter cut internal corners.

D. Install base on solid backing. Bond tightly to surfaces.

E. Scribe and fit to door frames and other interruptions.

F. Fixed Casework: Provide resilient base at all fixed casework unless otherwise indicated.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.07 PROTECTION OF FINISHED WORK

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Protect installed products until completion of project.

END OF SECTION

SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin-set epoxy terrazzo.

B. Crack detailing installation.

C. Thin-set, precast epoxy terrazzo tread units.

D. Thin-set, precast epoxy terrazzo wall base units.

E. Related accessories.

1.02 SUBMITTALS

A. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer.

B. Samples: Provide the following:
   1. Epoxy Terrazzo: 6 x 6 inches (150 x 150 mm) in size illustrating color, chip size and variation, chip gradation, matrix color and typical divider strip.
   2. Precast Epoxy Terrazzo: 12 inches (305 mm) long sample of each precast item required.
   3. Accessories: 6 inches (150 mm) long divider strip and control joint strip.
   4. Combination Tread/Riser: 12 inches (305 mm) wide sample of combination tread/riser with cast-in nosing.

C. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.

D. Qualifications: Submit proof of installer and manufacturer membership in NTMA.

E. Shop Drawings: Indicate divider strip and control joint layout, and details of adjacent components.
   1. Include stair treads, risers and landings.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

B. Installer Qualifications: A qualified installer who is acceptable to epoxy terrazzo manufacturer to install manufacturer's products.
   1. NTMA member.
   2. Approved by epoxy terrazzo manufacturer.
   3. Not less than five years experience and with at least three projects of comparable scope and complexity of at least 50 percent of total square footage of this project.

C. Pre-installation Conference: Conduct conference at Project site. Review methods and procedures related to terrazzo including, but not limited to, the following:
   1. Inspect and discuss installation procedures, joint details, jobsite conditions, substrate specification, vapor barrier details and coordination with other trades.
   2. Review and finalize construction schedule and verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review special terrazzo designs and patterns.
   4. Review dust-control procedures.
   5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions in accordance with Part 3 - Execution..

D. Mock-Up: Install mock-up to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
   1. For epoxy terrazzo, install mock-up of at least 100 sq.ft. (9 sq.m) of typical flooring and base condition for each color and pattern in locations directed by Architect.
   2. Mock-up, if approved, may become part of the completed work.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Store resin materials in a dry, secure area.

B. Maintain minimum temperature of 55 degrees F (13 degrees C).

C. Keep products away from fire or open flame.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install terrazzo when temperature is below 50 degrees F (10 degrees C) or above 90 degrees F (32 degrees C).

B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

C. Verify that the dew point is at least 5 deg F (-15 deg C) less than the slab and air temperature.

D. Provide ambient lighting level of 50 ft candles (540 lx), measured at floor surface.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Indoor Environmental Quality - Low-Emitting Paints and Coatings:
   1. Provide clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements complying with South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004 for VOC content limits as follows:
      a. Floor Coatings: 100 g/l.
      b. Sealers:
         1) Waterproofing Sealers: 250 g/l.
         2) Sanding Sealers: 275 g/l.
         3) All Other Sealers: 200 g/l.

2.02 MANUFACTURERS

A. Epoxy Terrazzo:
   1. Master Terrazzo Technologies; Morricite Thinset Epoxy: www.masterterrazzo.com.
   2. Basis of Design: Terrazzo & Marble Supply Companies; Terroxy Resin Systems. www.tmsupply.com.
   3. General Polymers; Thin-Set Epoxy Terrazzo No. 1100: www.generalpolymers.com.

B. Precast Epoxy Terrazzo Products:
   1. Precast Terrazzo Enterprises; Raleigh, NC 800-849-8849.
   2. Romoco Precast Terrazzo Products; Manheim, PA 717-665-2739.
   3. Wausau Tile; Wausau, WI 800-388-8728.

2.03 EPOXY TERRAZZO

A. Thickness: 3/8 inch (9 mm).

B. Custom Mix TZ1 (TM#23-403):
   1. Matrix Color: SW7004 Snowbound.
   2. Aggregate Name: Georgia White.
      a. Size: No. 0.
      b. Percentage: 10.
   3. Aggregate Name: Georgia White.
      a. Size: No. 1.
      b. Percentage: 10.
   4. Aggregate Name: Georgia White.
      a. Size: No. 2.
      b. Percentage: 20.
   5. Aggregate Name: Ultra White.
      a. Size: No. 1.

b. Percentage: 20.
6. Aggregate Name: Ultra White.
a. Size: No. 2.
b. Percentage: 20.
7. Aggregate Name: Pepper Harvest.
a. Size: No. 1.
b. Percentage: 10.
8. Aggregate Name: NC Blue Gray.
a. Size: No. 0.
b. Percentage: 5.
9. Aggregate Name: NC Blue Gray.
a. Size: No. 1.
b. Percentage: 5.

C. Custom Mix TZ2 (TM#23-941):
1. Matrix Color: SW7651 Front Porch.
2. Aggregate Name: Georgia White.
a. Size: No. 0.
b. Percentage: 5.
3. Aggregate Name: Georgia White.
a. Size: No. 1.
b. Percentage: 20.
4. Aggregate Name: Georgia White.
a. Size: No. 2.
b. Percentage: 20.
5. Aggregate Name: Blue Bardiglio.
a. Size: No. 0.
b. Percentage: 5.
6. Aggregate Name: Blue Bardiglio.
a. Size: No. 1.
b. Percentage: 20.
7. Aggregate Name: Blue Bardiglio.
a. Size: No. 2.
b. Percentage: 20.
8. Aggregate Name: Modern MOP.
a. Size: No. 1.
b. Percentage: 10.

D. Custom Mix TZ3 (TM#23-402):
1. Matrix Color: SW6991 Black Magic.
2. Aggregate Name: Raven Black.
a. Size: No. 0.
b. Percentage: 10.
3. Aggregate Name: NC Blue Gray.
a. Size: No. 0.
b. Percentage: 5.
4. Aggregate Name: NC Blue Gray.
a. Size: No. 2.
b. Percentage: 20.
5. Aggregate Name: Clear Plate.
a. Size: No. 1.
b. Percentage: 10.
6. Aggregate Name: One Sided Mirror.
a. Size: No. 1.
b. Percentage: 10.

7. Aggregate Name: Blue Bardiglio.
   a. Size: No. 1.
   b. Percentage: 15.
8. Aggregate Name: Blue Bardiglio.
   a. Size: No. 2.
   b. Percentage: 20.
9. Aggregate Name: Classic MOP.
   a. Size: No. 2.
   b. Percentage: 10.

E. Precast Base: Same type and thickness as floors.
   1. Matrix Color: Match adjacent floor.
   2. Aggregate Color: Match adjacent floor.

F. Precast Treads and Risers and Landings: Epoxy matrix.
   1. Matrix Color: Match Custom Mix 2.
   2. Aggregate Color: Match Custom Mix 2.
   3. Aggregate Size: No. 0-1.
   4. Configuration: as indicated in Drawings.
      a. Risers: Non-slip inserts in contrasting color selected by Architect.

2.04 MATERIALS

A. Epoxy Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

B. Aggregate: Crushed marble, size in accordance with NTMA Plate of standard gradation and uniform coloration.

2.05 ACCESSORIES

A. Metal Strips: Refer to Section 09 60 10 - Flooring Transitions.

B. Divider Strips: 1/8 inch (3 mm) thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

C. Control Joint Strips: 1/8 inch (3 mm) nominal width zinc exposed top strips, zinc coated steel concealed bottom strips.

D. Non-Slip Inserts: Zinc, 3/8 x 3/8 inches (9 x 9 mm) x 20 gauge (0.9 mm) dove-tail shaped channels, with anchors, filled with aluminum oxide non-slip filler.

E. Epoxy Grout: 100 percent solids grout.

F. Control Joint Filler: 100 percent solids flexible, grindable epoxy joint filler in color selected by Architect to match or complement terrazzo system.

G. Cleaner: Neutralizing liquid type, pH of 7.

H. Sealer: Medium gloss water based acrylic sealer, low viscosity, clear acrylic finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03 30 00 and are ready to receive terrazzo.

B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09 21 16, are dust-free, and are ready to receive terrazzo.

C. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:

1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft (7.1 kg per 100 sq m) per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
2. Alkalinity: pH range of 5-9.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Clean substrate of foreign matter.

B. Prepare concrete substrate to open surface pores by means of vacuum shotblasting or with a terrazzo grinder, dry with coarse diamond stones with a vacuum unit. Achieve a CSPD-CSP5 profile according to International Concrete Repair Institute Technical Guideline 310.2R-2013. Remove contaminating or bond breaking substances including but not limited to dust, laitance, curing compounds, coatings, sealers, oil, and grease. Chemically remove oil or grease not removed by vacuum blasting. Remove spalled or deteriorated concrete by scabbling or chipping hammers. Acid etching is not acceptable.

C. Repair or level damaged concrete with epoxy fill mortar. Latex fills or self-leveling underlayments are not acceptable.

D. Cracks and non-expansion joints greater than 1/16 inch (1.5 mm) wide after surface preparation shall be prepared until sound.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NTMA's written recommendations for terrazzo and accessory installation.

B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Guide Specification for Epoxy Terrazzo."

C. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.

D. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

3.04 PREPARATION FOR EPOXY TERRAZZO INSTALLATION WITH CRACK DETAILING

A. Divider and Accessory Strips: Install in locations indicated in adhesive setting bed without voids below strips.

B. Control-Joint Strips: Install back to back directly over concrete control and now-doweled construction joints leaving a space appropriate for anticipated movement- typically 1/4 inch (6 mm) to 3/8 inch (10 mm). Fill gap between control joints with joint filler.

C. Cracks and Non-Expansion Joints:
1. Type 1 - Hairline cracks shall receive detail coat of epoxy primer with 6 inches (150 mm) fiberglass tape.
2. Type 2 - Fill cracks greater than hairline but less than 1/16 inch (1.5 mm) wide after surface preparation with neat, epoxy membrane. Place detail coat of membrane over crack and embed 12 inches (305 mm) fiberglass cloth. Lightly abrade or solvent wipe treated cracks prior to applying primer.
3. Type 3 - Fill cracks greater than 1/16 inch (1.5 mm) with flexible epoxy membrane. Place 25 - 30 mils (0.63 - 0.76 mm) detail coat so that membrane extends at least 9 to 12 inches (230 to 305 mm) on each side of crack or joint. After membrane has leveled, lay precut membrane fabric into wet membrane. Smooth cloth with a flat steel trowel, allowing cloth to be encapsulated but remain exposed on the surface of membrane. Lightly abrade, or solvent wipe, treated cracks prior to applying primer. Allow in base bid for above crack detailing as follows: 5 percent of lineal footage of total project square footage for combined Type 1 & 2, and 3 percent of lineal footage of Type 3.

D. Primer: Apply epoxy primer evenly over prepared substrate, cracks and non-expansion joints at the rate of 200 - 300 sq.ft/gal (5 - 7.3 sq.m/l) for normal concrete, to thoroughly wet surface, but avoiding ponding the material. Highly porous concrete may require additional material.

3.05 APPLICATION - TERRAZZO

A. Mix terrazzo binder with chips and fillers in ratios as approved by manufacturer.

B. Trowel apply terrazzo mixture over epoxy primer to provide smooth seamless surface at a minimum of 3/8 inch (10 mm) thick. Allow cure per manufacturer's recommendations prior to grinding operations.

C. Flush Vertical Base: Bond topping to wall.

3.06 FINISHING

A. Finish terrazzo to NTMA requirements.

B. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates.

C. Intermediate Grinding: Follow initial grind with 80 or finer grit stones.

D. Grouting:
   1. Cleanse floor with clean water and rinse thoroughly.
   2. Remove excess rinse water by wet vacuum and machine until completely dry.
   3. Apply epoxy grout to fill voids.

E. Fine Grinding: Grind with 120 grit stones until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding (400 grit stones). Produce surface with a minimum of 70 percent aggregate exposure.

F. Hand grind base similarly.

G. Remove and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo.

3.07 INSTALLATION TOLERANCES

A. Maximum Variation from Flat Surface: 1/8 inch in 10 feet (3 mm in one m).

B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch (3 mm).

3.08 PRECAST EPOXY TERRAZZO

A. Set units using method recommended by NTMA and manufacturer unless otherwise indicated. Set units with alignment level and true to dimensions, varying 1/8 inch (3 mm) maximum in length, height, or width.
   1. Treads and risers: Back-butter for full contact with substrate.

B. Seal joints between units with joint sealants.

3.09 CLEANING

A. Scrub and clean terrazzo surfaces with cleaner in accordance with manufacturer's instructions. Let dry.

B. Immediately after terrazzo has dried, apply two (2) coats of sealer in accordance with manufacturer's instructions.

C. Seal and polish surfaces, in accordance with manufacturer's instructions.

3.10 PROTECTION OF FINISHED WORK

A. Do not permit construction traffic over finished terrazzo surfaces.

END OF SECTION

SECTION 09 67 23 - RESINOUS FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Application of resinous flooring system.

1.02 SUBMITTALS

A. Product Data: Manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.
   1. Submit maximum amount of moisture content allowed in concrete substrate at time of installation covered under Warranty.
   2. Submit minimum surface tensile strength of concrete required under Warranty.

B. Shop Drawings:
   1. Show on plans the location and extent of each flooring system. Incidate type of floor, color and pattern, locations of control joints, expansion joints, isolation joints, divider strips, and other joint conditions.
   2. Furnish detail drawings illustrating each joint type and flooring terminations at walls, adjacent dissimilar flooring, door sills, door frames, pits and curbs, etc.

C. Color and Texture Samples: Submit, for verification purposes, 10 inches (250 mm)- square samples of each type of resinous flooring required, applied to a rigid backing, in color and texture indicated.
   1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and textures available.

D. Installer Qualifications.

E. Field Test results: Slab vapor transmission.

1.03 QUALITY ASSURANCE

A. Resin manufacturer's technical representative shall be available for site visit and consultation on project flooring when requested by the Architect and to advise applicator on proper surface preparation and application techniques.

B. Installer Qualifications: Company specializing in performing the work of this section with at least 3 years documented experience and certified by the resin manufacturer.
   1. Certification:
      a. Installer shall be a company licensed by or approved by the resin materials manufacturer for materials specified in this section and for projects similar in scope to work included.
      b. Licensing or approval shall have been in effect continuously for at least one year prior to the date of bid opening or, if none, the date of award of the general contract, for this Project.
      c. Licensing or approval shall qualify for manufacturer's premium labor and material warranty.
   2. Installer shall designate a single individual as project foreman who shall be on site at all times during installation. Installer shall designate key personnel of the on-site crew who shall be experienced in work of the type specified. Neither the foreman nor the key personnel shall be changed without the Architect's consent.

1.04 MOCK-UP

A. Resin manufacturer's technical representative shall be present during construction of the mock-up.

B. Install Resinous Flooring System mock up in one room only, selected by the Architect, for verification of color and texture.

C. If no rooms should be of suitable size for mock-up, provide 4 feet (1.2 m)-square sample panels, constructed of concrete not less than 3-1/2 inches (90 mm) thick, in lieu of mock-up in actual room.
   1. Provide one 4 feet (1.2 m)-square panel per floor color or type.

D. Notify Architect prior to installation to schedule review of mock up.

E. Do not proceed with remainder of the work without Architect's written approval of mock up.

F. Adjust mock-up texture and appearance as directed by the Architect.

G. Demolish and remove 4 feet (1.2 m)-square sample panels after all resinous floor is complete, and approved. Obtain Architect's written approval to demolish and remove approved quality standard panels.

H. Locate where directed.

I. Approved Mock-up room may be incorporated into the Work.

1.05 PRE-INSTALLATION CONFERENCE:

A. General Contractor shall arrange a meeting not less than ten days prior to starting work.

B. Attendance:
   1. Contractor.
   2. Architect's Representative.
   3. Owner's Representative.
   4. Manufacturer Representative.
   5. Installer’s Foreman.

C. Review floor substrate conditions, including but not limited to:
   1. Flatness.
   2. Obstructions.
   3. Grout, mortar droppings, divots, holes, and other defects.
   4. Joints.
   5. Cracks.
   6. Drains.
   7. Slope to drains.
   8. Floor-wall interfaces.
   9. Existing coatings, sealers, curing compounds, etc.
   10. Surface profile.

1.06 DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Deliver materials in manufacturer's original containers bearing coating name and color, material composition data, date of manufacture, legal notices if applicable, and mixing, thinning, and application instructions.

B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

C. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 90 deg F (15.5 and 32 deg C), unless manufacturer requires more stringent storage conditions.

1.07 PROJECT CONDITIONS

A. Concrete substrate shall be properly cured for at least 30 days.

B. Apply coatings only under the following environmental conditions:
   1. Air and surface temperatures are between 70 and 85 deg F (21 and 30 deg C) .
   2. Relative humidity is less than 75 percent.
   3. Surface temperature is at least 5 deg F (2.5 deg C) above dew point.
   4. Permanent lighting system shall be functional, or provide temporary lighting providing with at least the level of lighting given by permanent lighting system.

C. Job area to be free of other trades during, and for a period of 24 hours after, floor installation.

D. Provide continuous ventilation and heating to prevent accumulation of hazardous fumes, and maintain surface and ambient temperatures above 70 deg F (21 deg C) for 24 hours before, during, and for 48 hours after application of finishes, or longer if required to obtain full cure as indicated by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all products for each system specified in this section from or approved by a single manufacturer.

2.02 MANUFACTURERS

A. Provide all flooring specified in this section from a single manufacturer.

2.03 RESINOUS FLOORING (RF1) TYPE

A. Dudick:
   1. "Mortar"
      a. Green Concrete Barrier: Apply Shock-Crete SL at 120 mils (3.0 mm) wet and immediately broadcast with 30/40 washed silica sand at a rate of 1/2 lb/sq.ft (2.5 kg/sq.m). Allow to cure. Remove loose sand, and apply Primer 67 at 2 - 3 mils (0.050 - 0.076 mm) wet.
      b. Mortar Body Coat: Apply SteriFlor T SL/SF at not less than 187 mils (4.750 mm) wet and immediately broadcast to excess with 30/40 mesh washed silica sand. Allow to cure. Remove loose sand.
         1) Top Coat - wet: Apply SteriFlor T SL/SF with approved grit to achieve approved texture (and not less than at 8 - 10 mils (0.20 - 0.254 mm) wet).
         2) Sealer: Apply Urethane Sealer 30 at 5 - 6 mils (0.127 - 0.152 mm) wet.
      c. Cove Base Mortar: for Cleaning Demo room 350J.
         1) Epoxy-based gel with mortar aggregate.
         2) Basis-of-Design product: Subject to compliance with requirements, provide Stericove gel.

B. Stonhard:
   1. "Mortar"
      a. Green Concrete Barrier: Apply Stondri MVT at not less than 15 mils (0.380 mm).
      b. Mortar Body Coat(s): Apply Stonclad GS AB and trowel to a 1/4 inch (6 mm) thickness.
         1) Top Coat - wet: Mix 1 bag of Texture 2 per 2 units of Stonkote GS 4 and apply at 6 mils (0.152 mm) wet (6 mils (0.152 mm) dry).

C. Tnemec:
   1. "Mortar"
      a. Green Concrete Barrier: Apply Ultra-Tread MVT Series 241 and immediately broadcast to refusal with 30/40 mesh washed aggregate; 125 mils (3.175 mm) dry. Allow to cure. Remove loose aggregate.
      b. Body Coats:
         1) Mortar: Apply Power-Tread Series 237 mixed with Part C Tnemec aggregate (6.5 to 1 rock to resin ratio by weight) to a wet thickness of 250 mils (6.350 mm) (250 mils (6.350 mm) dry).
         2) Top Coat - wet: Apply Tneme-Glaze Series 280 at 8 - 10 mils (0.20 - 0.254 mm) wet (8 - 10 mils (0.20 - 0.254 mm) dry).

2.04 ACCESSORY MATERIALS

A. Joint Sealant: Type recommended by flooring manufacturer.

B. Divider Strips:

1. Refer to Section 09 60 10 - Flooring Transitions.
2. Cove Strip: Provide manufacturer's standard metal cove strip and divider strips at cove base.
3. Material: Zinc.
4. Divider Strip: Provide manufacturer's standard zinc metal divider strip.
5. Expansion Strip: Back-to-back metal "L" strips bonded to 1/4 inch (6 mm)-wide black neoprene filler.

C. Manufacturer's standard crack and joint treatment materials.

2.05 MIXING

A. Mix materials according to manufacturer's latest printed instructions paying particular attention to mixing times and temperatures.

B. Do not use materials beyond manufacturer's recommended pot life or shelf life.

PART 3 EXECUTION

3.01 PRE-WORK INSPECTION

A. Examine surfaces to be coated and report conditions that would adversely affect appearance or performance of systems and which cannot be put into an acceptable condition by preparatory work specified.

3.02 PREPARATION

A. Apply coatings to clean, properly prepared surfaces. Remove dirt, dust, grease, oils, and foreign matter. Prepare surface to achieve proper texture necessary for optimum coating adhesion and intended finished appearance. Plan cleaning, preparation, and coating operations to avoid contamination of freshly coated surfaces.

B. Concrete Floor Substrate: Concrete preparation shall be by mechanical means and include the use of a shot blast machine for removal of bond inhibiting materials such as curing compounds, laitance, and previous coatings in their entirety. Acid etching is not acceptable.

C. After blast cleaning of the substrate, test the vapor transmission of slabs on grade by means of a calcium chloride test in which a sample is weighed to the nearest 0.01 gram before and after exposure. A plastic film test alone is unacceptable. Report results to the Architect and the flooring manufacturer's representative. Tests required:
1. 1 test for areas up to 250 sq.ft (23.2 sq.m).
2. 2 tests for areas up to 500 sq.ft (46.4 sq.m).
3. 3 tests for areas up to 1000 sq.ft (93.0 sq.m).
4. 4 tests for areas up to 5000 sq.ft (464.5 sq.m).
5. 1 additional test for each additional 5000 sq.ft (464.5 sq.m).

D. If required by the Architect, install vapor-pressure-resistant grout prior to installing finish flooring system.

E. Treat cracks, joints, drains, edge of flooring without walls, and other conditions in accordance with this specification and with manufacturer's written instructions and details.

F. Do not proceed with application until surface is acceptable and authorization to proceed is given by the Architect.

3.03 APPLICATION

A. General:
1. Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.
2. Do not install flooring without the Architect's prior approval of the mock-up.

B. Divider Strips and Interruptions: Manufacturer's standard methods that use cold joints without divider strips between adjacent pours are unacceptable.

1. Complete each entire room or space, in a single operation, without breaks or interruptions.
2. Incomplete rooms or spaces requiring joints are not acceptable, unless approved in advance in writing by the Architect.
3. Where size or configuration of space is impracticable to cover in a single pour given the crew size employed by the Contractor, obtain the Architect's written approval of the use of, and location of divider strips; or provide sufficient crew to achieve a single pour, as directed by the Architect, without change in contract time or price.
4. Separate every individual pour, from each adjacent pour, by means of a divider strip.
5. In doorways, locate divider strips centered beneath door, unless otherwise directed.
6. Install divider strips where epoxy flooring abuts other flooring materials.

C. Joints: Verify locations of all joints in substrate, and install flooring joints in accordance with flooring manufacturer's instructions.

D. Integral Coved Base:
1. Provide integral coved base of same material as flooring at all wall and curb locations. Install base per manufacturer's instructions.
2. Base to be 4 inches (100 mm) high, and shall terminate with metal cove strip.
3. Install bead of clear sealant at joint between top of cove strip and wall.

E. Epoxy Flooring:
1. Apply in strict conformance with manufacturer's printed instructions.
2. Ensure that finished color, surface appearance, and surface texture match the approved mock-up.
3. Where flooring does not match approved mock-up, the Architect may direct either adjustment of appearance and texture of flooring, or the removal of the flooring in its entirety and reinstallation.

3.04 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application to traffic of all types for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to Final Inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 09 68 13 - TILE CARPETING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Carpet tile, fully adhered.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Shop Drawings: Indicate layout of joints.

C. Samples: Submit three carpet tiles illustrating color and pattern design for each carpet color selected.

D. Accessory Samples: Submit three 6 inch (150 mm) long samples of edge strip.

E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.03 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project.
   1. Extra Carpet Tiles: Quantity equal to 5 percent of total installed, but not less than one carton, of each color and pattern installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tile Carpeting, Type 1: Tufted, manufactured in one color dye lot.
   1. Basis of Design Product: Ethos Modular w/ Omnicoat Technology manufactured by Tarkett Commercial.
   2. Contact: Stephane Harris, stephanie.harris@tarkett.com, 910.710.3900.
   3. Acceptable Alternate Products:
      a. Bentley Mills; Outlier, Perimeter, 18 inches by 36 inches, Custom colored to match Architect's sample.
      b. Mannington Commercial; RPM, 34828, 12 inches by 48 inches, Custom colored to match Architect's sample.
   4. Tile Size: 18 by 36 inch (457 by 915 mm), nominal.
   5. Color: Indigo Run 57206, Custom Color blue accent.
   6. Pattern: Aida Cloth G0052,.
   7. Installation: Vertical Ashlar.

B. Tile Carpeting, Type 2: Tufted, manufactured in one color dye lot.
   1. Basis of Design Product: Ethos Modular w/ Omnicoat technology manufactured by Tarkett Commercial.
   2. Contact: Stephane Harris, stephanie.harris@tarkett.com, 910.710.3900.
   3. Acceptable Alternate Products:
      a. Interface, Walk The Plank, 103948 Eucalyptus (60% mix) with 8762 Cyprus (40% mix), custom colored to match Architect's sample, 9 inches x 40 inches plank.
      b. Mannington Commercial; Channel, 34828, R&B 11821 (50% mix) with Delta Blues 34828 (50% mix), custom colored blue to match Architect's sample, 12 inches x 48 inches plank.

4. Tile Size: 9 by 36 inch (229 by 915 mm), nominal.
5. Color: Mineral Springs 75007.
6. Pattern: Stack 9 04332.
7. Installation: Vertical Ashlar.

C. Walk-off Tile Carpeting, Type 3: Tufted, manufactured in one color dye lot.
1. Basis of Design Product: Tuff Stuff II manufactured by Mohawk Group.
2. Acceptable Alternate Products:
a. Mannington Commercial: Ruffian II, Ebony Earth 1506.
b. Tarkett Commercial: 08437 Assertive Action, 26202 Steelwork.
3. Tile Size: 24 by 24 inch (610 by 610 mm), nominal.
4. Style: Step Up II GT311.
5. Color: Cobalt.
6. Backing: EcoFlex NXT.
7. Installation: Quarter Turn.

D. Tile Carpeting, Type 4: Tufted, manufactured in one color dye lot.
1. Owner-furnished, Contractor-installed (OFCI).
2. Product: Kinetex manufactured by J+J Commercial Flooring.
3. Tile Size: 24 by 24 inch (610 by 610 mm), nominal.
4. Color: 3443 Upheavel.
5. Pattern: 1851 Game Changer.
6. Installation: Ashlar.

2.02 ACCESSORIES

A. Edge Strips: As specified in Section 09 60 10 - Flooring Transitions.

B. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 05 61.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in plank pattern, with pile direction parallel to next unit, set aligned as indicated on shop drawings.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 84 14 - ACOUSTIC STRETCHED-FABRIC WALL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustic stretched-fabric wall system.

B. Accessories as required for complete installation.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

B. Shop Drawings: Details indicating typical transitions to other finish surfaces.

C. Verification Samples:
   1. For each fabric specified, minimum size 12 inch (305 mm) square, representing actual product in color, texture, and pattern.

D. Test Reports: Certified test data from an independent test agency verifying that wall and ceiling systems meet specified requirements for acoustical and fire performance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Stretched-Fabric Wall Systems:
   1. Fabric Wall: www.fabric-wall.com.
   2. Fabricmate Systems: www.fabricmate.com.
   3. FabriTRAK Systems, Inc: www.fabritrak.com.
   4. Novawall Systems, Inc: www.novawall.com.

2.02 ACOUSTIC STRETCHED-FABRIC SYSTEM

A. Acoustic Stretched-Fabric System: Field installed, fabric is stretched and set into framework and laid over acoustic material anchored to substrate. Framework consists of continuous perimeter and intermediate mounting frames anchored to substrate, and designed to permit removal and replacement of fabric within framed areas without affecting adjacent areas.
   1. Surface Burning Characteristics: Flame Spread Index of 25, maximum; Smoke Developed Index of 450, maximum; when whole system is tested in accordance with ASTM E84 using mounting specified in ASTM E2573 for stretched systems.
   2. Noise Reduction Coefficient (NRC): 0.80, minimum, when tested in accordance with ASTM C423, Type A mounting per ASTM E795.

B. Verify that adhesives and sealants used in installation of acoustic stretched-fabric system have acceptable low VOC emission ratings.

2.03 MATERIALS

A. Frame: Extruded polymer framing system with serrated jaws of sufficient strength to hold fabric in place after repeated applications.
   1. Wall Frame Size: 1/2 inch (12.7 mm) height from wall substrate with minimum 1 inch (25.4 mm) wide base.
      a. Wall Frame Shape: Square at perimeter, and square at intermediate abutting joints.

B. Acoustic Material:
   1. Provide type of acoustic material in thickness required to achieve Noise Reduction Coefficient (NRC) indicated.
   2. Ensure that thickness of acoustic material fills depth of frame as necessary for application without use of support blocking.

C. Fabric:
   1. Basis of Design (AWP1): Maharam.
      a. Style Number: 466579 Method.
      b. Color: 010 Relax.
   2. Acceptable alternate materials:
      a. Momentum; Script.
      b. Carnegie; Casa.

D. Adhesives: Low VOC or water-based, and approved by acoustic stretched-fabric system manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install acoustic stretched-fabric system at locations indicated in accordance with approved shop drawings and manufacturer's instructions.

B. Frames: Install perimeter and intermediate frames using appropriate fasteners for prepared substrate, firmly secured to ensure frames do not separate from substrate.
   1. For tile or masonry substrates, apply continuous bead of adhesive along base of framing in addition to spacing of conical anchors and/or fasteners at 6 to 8 inches (152 to 203 mm) on center.
   2. Follow contours of wall and scribe to adjoining work at borders, penetrations, and imperfections.
   3. Install framing around openings and penetrations.
   4. Allow for spacing of framework to accommodate insertion of installation tool.

C. Acoustic Material: Cut and trim acoustic material to fit snugly within perimeter and intermediate framework.
   1. Apply adhesive and press acoustic material into place, maintaining constant plane.

D. Fabric: Stretch fabric over acoustic material, locking edges of fabric into frame's serrated jaws using manufacturer's recommended tool. Maintain fabric weave plumb, level and true, in proper relation to building lines, without ripples, waviness, hourglass, or other deleterious effects.
   1. Upon fabric installation, do not employ adhesives or mechanical fasteners of any type, and ensure fabric is free-floating and in contact with acoustic material as necessary.
   2. Stapling or gluing of fabric to cores or channel framework is not permitted.
   3. Provide tension in fabric sufficient to prevent sagging under anticipated changes in temperature and humidity.

END OF SECTION

SECTION 09 91 00 - PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Surface preparation.
   2. Field application of paints.
   3. Paints and Coatings on Exterior Substrates.
      a. Galvanized metals.
   4. Paints and Coatings on Interior Substrates.
      a. Galvanized metals.
      b. Overhead ferrous and non-ferrous metal.
      c. Gypsum board.
      d. Gypsum board ceilings.
      e. Wood trim, painted.
      f. Telephone and electrical panel backers.
   5. See Schedules at end of this Section.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

B. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

B. Gloss Ranges: Tested in accordance with ASTM D523.
   1. Flat refers to a lusterless or matte finish with a gloss range between 0 and 5 when measured at a 60-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
   3. Satin refers to low-to-medium-sheen finish with gloss range between 15 and 35 when measured at a 60-degree meter.
   4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
   5. Gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data: Provide data on all finishing products including:
   1. Manufacturer name.
   2. Product Type.
   3. Product Name.
   4. Product Number.
   5. Color.

B. Samples: Submit three paper chip samples, 8x10 inch (203x254 mm) in size for each surface finishing product and color and sheen scheduled.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing. Information shall be legible.

C. Use of off-brand containers or mixing buckets will not be allowed on the site.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions. Protect from freezing.

1.06 PROJECT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, on surfaces coated with frost, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Do not apply exterior coatings in windy and dusty conditions.

D. Do not apply exterior coatings in direct sunlight or on surfaces which will soon be warmed by the sun.

E. Application Temperatures for Waterborne Paints: Minimum 45 degrees F (7 degrees C) for interiors; minimum 50 degrees F (10 degrees C) for exterior; maximum 90 degrees F (32 degrees C), unless required otherwise by manufacturer's instructions. Maintain interior temperatures until paint is completely dry and cured.

F. Application Temperatures for Solvent Thinned Paints: Minimum 50 degrees F (10 degrees C) for interiors and exterior; maximum 95 degrees F (35 degrees C), unless required otherwise by manufacturer's instructions. Maintain interior temperatures until paint is completely dry and cured.

G. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

H. Ventilation: Ventilate affected areas during paint application. Exhaust solvent vapors outdoors, away from air intakes and people.

1.07 MAINTENANCE MATERIALS

A. Supply 5 percent, but not less than 1 gallon (4 L), of each color and type of topcoat; store where directed.

B. Label each container with color in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS:

A. Provide interior paints and coatings complying with Green Seal Standard GS-11 Paints, First Edition, May 20, 1993, for VOC content limits as follows:
   1. Non-Flat: 150g/l.
   2. Flat 50 g/l.

B. Provide anti-corrosive and anti-rust paints applied to interior ferrous metal substrates complying with Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997, for VOC content limits as follows:
   1. Flat: 250 g/l
   2. Semi-gloss: 250 g/l.
   3. Gloss: 250 g/l.

C. Provide clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements complying with South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004 for VOC content limits as follows:
   1. Clear wood finishes:
      a. Varnish: 350 g/l.
      b. Lacquer: 550 g/l.

2. Floor Coatings: 100 g/l.
3. Sealers:
   a. Waterproofing Sealers: 250 g/l.
   b. Sanding Sealers: 275 g/l.
   c. All Other Sealers: 200 g/l.
4. Shellac:
   a. Clear: 730 g/l.
   b. Pigmented: 550 g/l.
5. Stains: 250 g/l.

2.02 MANUFACTURERS - PAINTS

A. Benjamin Moore & Co: www.benjaminmoore.com.

B. PPG Paints, Inc.: www.ppgpaints.com.

C. The Sherwin-Williams Co: www.sherwin-williams.com.

2.03 MANUFACTURER - METAL CLEANER

A. Chemetall Oakite; www.oakite.com.metal cleaner

2.04 PAINTS AND COATINGS - GENERAL

A. Do not use insecticides in paint materials

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. General:
   1. Start of the surface preparation or paint materials application will be construed as applicator's acceptance of the surfaces as satisfactory for application of materials.
   2. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
   3. Surfaces: Correct defects and clean surfaces of substances which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
   4. Marks: Seal with sealer compatible with primer and finish coats marks which may bleed through surface finishes.
   5. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
   6. Reduce the gloss of glossy surfaces to be painted.
   7. Fill nail holes, cracks, chips, spalls, and similar damaged areas to match adjacent undamaged areas.

B. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent in accordance with SSPC-SP 1 or detergent. Wipe with metal cleaner, rinse, and wipe dry.

C. Metal Piping: The semitransparent film applied at the mill to some piping and tubing is not considered a shop applied primer. Where indicated to be painted, overcoat with the specified ferrous metal primer.

D. Gypsum Board Surfaces to be Painted:
   1. Fill minor defects with filler compound. Spot prime defects after repair.
   2. Remove loose dust and dirt by brushing with a soft brush, rubbing with a cloth, or vacuum cleaning. A damp cloth may be used when water based paint materials are to be applied. Allow to dry.

E. Wood:
   1. Wipe off dust and grit prior to priming.
   2. Scrape and clean small, dry seasoned knots, then apply a thin coat of commercial knot sealer, before application of the priming coat.
   3. Scrape off pitch on large, open, unseasoned knots and all other beads or streaks of pitch and sap. If the pitch is still soft, remove with mineral spirits or turpentine, and thinly coat the resinous area with knot sealer.
   4. Back prime concealed surfaces before installation.
   5. Sand between coats.
   6. Set finishing nails, fill holes, and prime surface imperfections. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sand smooth.

F. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.

3.03 APPLICATION

A. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

B. Thinning:
   1. When thinning is required to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions.
   2. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds.

C. Do not mix paint materials of different manufacturers.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Minimum Coating Thickness:
   1. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness as recommended by manufacturer. Provide total dry film thickness of the entire system as recommended by manufacturer.
   2. Strip paint to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
   3. Apply each coat of paint so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color,

texture, and finish. Hiding shall be complete. If application thickness or color and opacity of the paint do not achieve complete hiding, apply additional coat(s) to achieve complete hiding without change in contract price.

H. Apply two coats of primer or sealer to surfaces of wood doors, including top and bottom edges, which are cut.

I. Back prime and seal ends of interior panel backer boards specified to be finished.

3.04 INTERIOR WALL AND CEILING JOINTS

A. Sealant-Type Expansion Joints in Gypsum Wallboard:
1. Ensure that backer rod and joint sealant (specified in Division 07) are completed and cured prior to application of paint.

B. Fillet Joints between Hollow Metal Door Frames and Adjacent Walls (and similar locations):
1. Ensure that backer rod and joint sealant (specified in Division 07) are completed and cured prior to application of paint.

3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to respective Sections in Divisions 21, 22, 23, and 26 for schedule of color coding of equipment, duct work, piping, and conduit.

B. Paint shop-primed equipment, where indicated.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.06 REPAIR AND RESTORATION

A. Reinstall electrical plates, hardware, light fixture trim, escutcheons, and fittings that were removed prior to preparing surfaces or finishing.

B. Restore to original condition surfaces damaged or marred by painting materials application.

C. Remove, refinish, or repaint work not complying with approved samples and other specified requirements.

3.07 PROTECTION AND CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.08 SCHEDULE - SURFACES TO BE FINISHED

A. Gloss: Paints applied to the following substrates shall have the gloss levels indicated, unless noted otherwise:
1. Interior and Exterior Steel Doors and Frames: Semi-gloss.
2. Gypsum Board Ceilings: Flat.
3. Interior Walls: Satin.
4. Interior and Exterior Miscellaneous trim, hardboard, handrails, etc.: Semi-gloss.

B. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished unless specifically noted.
2. Electrical panelboard covers.
3. UL, FMG, or other code required labels; fire rating labels; and equipment name, identification, performance rating, serial number and capacity labels.
4. Stainless steel items.
5. Plywood panel backers for electrical and security equipment.

C. Paint the surfaces described in Schedules at the end of this Section and as follows:
1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of permanently fixed equipment or furniture, paint surfaces behind permanently fixed equipment or furniture with primer only.

2. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
3. Finish exterior field-finished doors on tops, bottoms, and side edges the same as exterior faces.
4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

D. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
1. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.
2. Paint shop-primed items occurring in finished areas.
3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

3.09 EXTERIOR PRIMERS

A. Exterior Acrylic Galvanized Metal Primer:
1. Benjamin Moore & Co.; HP04 Ultra Spec HP Acrylic Metal Primer.
2. PPG Paints; 90-712 Pitt Tech Acrylic DTM Primer.
3. The Sherwin-Williams Co.; Pro Industrial Pro-Cryl Universal Primer B66W00310 Series.

3.10 EXTERIOR FINISH COATS

A. Gloss Alkyd Finish Coats for Ferrous and Galvanized Metals:
1. Benjamin Moore & Co.; P22 Super Spec Urethane Alkyd Gloss.
2. PPG Paints; 7-282 Series Int/Ext Industrial Gloss Oil Enamel.
3. The Sherwin-Williams Co.; B54Z-400 Series Industrial Enamel HS.

3.11 INTERIOR PRIMERS, SEALERS, AND FILLERS

A. Interior Acrylic Primer for Gypsum Board:
1. Benjamin Moore & Co.; N534 Ultra Spec 500 Interior Latex Primer. (0 g/l)
2. PPG Paints; 6-4900XI Speedhide Zero VOC Interior Primer. (0 g/l)
3. The Sherwin-Williams Co.; B28W02600 ProMar 200 Zero VOC Interior Latex Primer. (0 g/l)

B. Interior Acrylic Primer for Galvanized Metal:
1. Benjamin Moore & Co.; HP04 Ultra Spec HP Acrylic Metal Primer. (48 g/l)
2. PPG Paints; 90-712 Pitt-Tech Primer/Finish DTM Industrial Enamel. (123 g/l)
3. The Sherwin-Williams Co.; Pro Industrial Pro-Cryl Universal Primer B66W00310 Series.(<96 g/l)

C. Interior Acrylic Primer for Overhead Ferrous and Non-Ferrous Metal:
1. PPG Paints: PPG 90-912 Pitt-Tech Plus Int./Ext. DTM Industrial Primer. (90 g/l)
2. The Sherwin-Williams Co.; Pro Industrial Pro-Cryl Universal Primer B66W00310 Series. (96 g/l)

D. Interior Acrylic Primer for Wood:
1. Benjamin Moore & Co.; 046 Fresh Start High-Hiding All Purpose Primer. (44 g/l)
2. PPG Paints; 17-921XI Seal-Grip Acrylic Latex Stain Blocking Primer. (84 g/l)
3. The Sherwin-Williams Co.; PrepRite ProBlock Latex Primer, B51 Series. (96 g/l)

3.12 INTERIOR FINISH COATS

A. Flat Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
1. Benjamin Moore & Co.; N536 Ultra Spec 500 Interior Flat. (0 g/l)
2. PPG Paints; 6-4110XI Speedhide Zero VOC Flat Interior Latex. (0 g/l)
3. The Sherwin-Williams Co.; ProMar 200 Zero VOC Flat, B30-2600. (0 g/l)

B. Eggshell Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
1. Benjamin Moore & Co.; N538 Ultra Spec 500 Interior Eggshell. (0 g/l)
2. PPG Paints; 6-4310XI Speedhide Zero VOC Interior Eggshell Latex. (0 g/l)

3. The Sherwin-Williams Co.; ProMar 200 Zero VOC Eg-Shel, B20-2600. (0 g/l)

C. Semi-Gloss Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
1. Benjamin Moore & Co.; N539 Ultra Spec 500 Interior Semi-Gloss. (0 g/l)
2. PPG Paints; 6-4510XO Speedhide Zero VOC Interior Semi-Gloss Latex. (0 g/l)
3. The Sherwin Williams Co.; ProMar 200 Zero VOC Semi-Gloss B31-2600. (0 g/l)

D. Semi-Gloss Acrylic Finish Coats for Galvanized Metal:
1. Benjamin Moore & Co.; HP29 Ultra Spec D.T.M. Acrylic Semi-Gloss. (147 g/l)
2. PPG Paints; 90-474 Pitt-Tech Int/Ext Satin DTM Industrial Enamel. (227 g/l)
3. The Sherwin-Williams Co.; B66 Pro Industrial Acrylic Coating,Semi- Gloss. (0 g/l)

E. Low Gloss Acrylic Finish Coats for Overhead Ferrous and Non-Ferrous Metal:
1. PPG Paints; PPG 6-724XI Speedhide Super Tech WB Interior Acrylic Dry-Fog Semi-Gloss Latex. (29 g/l)
2. The Sherwin-Williams Co.; Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42W00080 Series. (<50 g/l)

3.13 PRIMER, INTERMEDIATE, AND TOP COAT COLORS

A. Except where coating materials cannot be tinted, tint each successive (primer, intermediate, top) coat of paint a sufficiently contrasting color to facilitate identification of complete coating coverage. The preceding coat may be in the same color family, but shall be noticeably different. Provide additional top coats without change in Contract Price if necessary to achieve complete hiding and uniform sheen.

B. Top coat colors are indicated on the drawings and schedules. For approval of actual colors, see sample and mock-up requirements specified above.

C. Top coat colors of manufacturers listed on the Finish Schedule (or elsewhere) indicate the required color, only, and do not indicate the required brand name product, which shall be as specified in above.

D. Top Coat Colors:
1. Before submitting samples for approval and before purchasing project quantities of material, confirm with the Architect that colors have not changed based on awarded flooring, tile, and countertop finishes.
2. Match the following colors:
a. Paint Color 1 (PC1); Match SW 7004 Snowbound.
b. Paint Color 2 (PC2); Match SW 7015 Repose Gray.
c. Paint Color 3 (PC3); Match SW 9150 Endless Sea.
d. Paint Color 4 (PC4); Match SW 6227 Meditative.
e. Paint Color 5 (PC5); Match SW 7017 Dorian Gray.
f. Paint Color 6 (PC6); Match SW 7007 Ceiling Bright White.
g. Paint Color 7 (PC7); Match SW 7069 Iron Ore.
h. Paint Color 8 (PC8); Match SW 7019 Gauntlet Grey.

3.14 PAINT SYSTEMS - EXTERIOR

A. Galvanized Metal:
1. First Coat: Acrylic galvanized metal primer.
2. Two Top Coats: Gloss alkyd finish.

3.15 PAINT SYSTEMS - INTERIOR

A. Galvanized Metal:
1. First Coat: Acrylic primer.
2. Two Top Coats: Semi-gloss acrylic finish.

B. Overhead Ferrous and Non-Ferrous Metal:
1. First Coat: Interior acrylic primer for overhead ferrous and non-ferrous metal.
2. Two Top Coats: Low gloss acrylic finish for overhead ferrous and non-ferrous metal.

C. Gypsum Board:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Eggshell acrylic finish.

D. Gypsum Board Ceilings:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Flat latex paint finish.

E. Wood Trim, and Panel Backers, Painted:
   1. First Coat: Primer.
   2. Two Top Coats: Semi-gloss acrylic finish.

END OF SECTION

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Surface preparation.
   2. Application of primers, intermediate coats, and top coats for each coating system.

B. Coating Systems Include:

09 96 00.LFM	Low Gloss Fluoro-urethane Metal Finish
09 96 00.LWE	Low Gloss Waterborne Epoxy

1.02 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

B. SSPC-SP 11 - Power-Tool Cleaning to Bare Metal; 2012, with Editorial Revision (2013).

C. SSPC-SP 2 - Hand Tool Cleaning; 2018.

D. SSPC-SP 3 - Power Tool Cleaning; 2018.

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 SUBMITTALS

A. Product Data: Manufacturer's technical data sheets for each coating.
   1. Material analysis including vehicle type and percentage by weight and by volume of vehicle, resin, and pigment.
   2. Application instructions including mixing, surface preparation, compatible primers and topcoats, recommended wet and dry film thickness, recommended application methods.

B. Color and Texture Samples:
   1. Provide for each coating system, color, and texture and applied to representative substrate samples.
   2. Label each sample with coating name and color.
   3. Prepare samples to show bare, prepared surface and each successive coat.

1.04 QUALITY ASSURANCE

A. Installer: A company skilled in the application of special coatings whose installations have performed in a satisfactory manner under comparable conditions.

B. Coordination with Work Specified in Other Sections: Where primers will be applied in the shop, apply the primers listed in the schedule at the end of this section.
   1. Exception: Shop primed steel doors and frames shall receive fabricator's standard shop primer, followed by one full field coat of the primer specified in the schedule at the end of this section.

C. Mock-up:
   1. Apply coatings to mock-ups in the presence of the coating manufacturer's technical representative.
   2. Metals: Mock up one element of each coating system and color. Apply to mock up specified in the respective fabrication section, or if no mock up is specified therein, apply to an on-site mock-up as directed by the Architect.
   3. Rooms: Mock up one room of each coating system including walls, ceilings, doors, and other elements.
   4. Apply full coating systems, including required textures and colors, to mock-up. In interior spaces, provide completed lighting, or similar, for viewing of mock-up.
   5. Demonstrate coating of control and expansion joints and joints to receive elastomeric joint fillers.
   6. Remove and reapply coatings until texture, color, and gloss are approved by the Architect.

7. Final approval of colors will be based on mock-up; obtain full job quantities of tinted materials only after obtaining final approval.
8. Apply coatings to mock-ups in locations as directed by the Architect.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original containers bearing coating name and color, material composition data, date of manufacture, legal notices if applicable, and mixing, thinning, and application instructions.

B. Storage:
1. Store materials in an orderly fashion and in clean, well-closed containers with labels intact.
2. Maintain above 40 degrees F. Do not allow materials to freeze.

1.06 PROJECT CONDITIONS

A. Apply coatings only under the following environmental conditions:
1. Air and surface temperatures are between 50 and 120 degrees F, or more restrictive when recommended by coatings manufacturer.
2. Surface temperature is at least 5 degrees F above dew point, or more restrictive when recommended by coatings manufacturer.
3. Relative humidity is less than 85 percent, or more restrictive when recommended by coatings manufacturer.

B. Do not apply coatings during inclement weather except within enclosed, conditioned spaces.

C. Provide temporary lighting to achieve a well-lit surface with a level of not less than 80 footcandles measured mid-height.

D. Provide continuous ventilation and heating to prevent accumulation of hazardous fumes, and maintain surface and ambient temperatures as specified above for 24 hours before, during, and for 48 hours after application of finishes (or longer if required to obtain full cure as indicated by manufacturer's instructions).

1.07 MAINTENANCE MATERIALS

A. At time of completing application, deliver stock of maintenance material to the Owner.

B. Furnish not less than one properly labeled and sealed gallon can of each type of finish coat of each color, taken from batch mix furnished for the work.

PART 2 PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Indoor Environmental Quality - Low-Emitting Materials - Paints and Coatings
1. Provide interior paints and coatings complying with Green Seal Standard GS-11 Paints, First Edition, May 20, 1993, for VOC content limits as follows:
a. Non-Flat: 150g/l.
b. Flat 50 g/l.
2. Provide anti-corrosive and anti-rust paints applied to interior ferrous metal substrates complying with Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997, for VOC content limits as follows:
a. Flat: 250 g/l
b. Semi-gloss: 250 g/l.
c. Gloss: 250 g/l.
3. Provide clear floor coatings applied to interior elements complying with South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004 for VOC content limits as follows:
a. Clear Floor Coatings: 100 g/l.

2.02 MANUFACTURERS

A. Provide all products of this section from a single manufacturer.

B. The brand-name products listed in the schedule at the end of this section and made by the following are the basis of the contract documents.
   1. Tnemec Company, Inc.
   2. Carboline.
   3. PPG Architectural Finishes.

C. Provide the products listed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work in accordance with the contract documents and coating manufacturer's recommendations.

B. Prior to commencement of work, examine surfaces scheduled to be finished.
   1. Report any unsatisfactory conditions in writing.
   2. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the applicator.
   3. Beginning work on an area will be deemed acceptance of surfaces in that area.

3.02 PREPARATION

A. Do not apply coatings to labels that identify equipment, fire-resistance ratings, etc.

B. Remove hardware, switch and outlet plates, lighting fixtures, etc., before applying coatings. After application of coatings, reinstall removed items. Employ only skilled workmen for removal and replacement of such items.

C. Provide protection for non-removable items not scheduled for coating.

D. Protect surfaces not scheduled for coating. Clean, repair, or replace to the satisfaction of the Architect any surfaces inadvertently spattered or coated.

3.03 SURFACE PREPARATION

A. General: Clean and prepare surfaces as specified. Achieve the surface profile recommended by the coating manufacturer for optimum adhesion and proper appearance.

B. All Surfaces: Ensure surfaces are clean, dry and free of oil, grease and other contaminants.

C. Gypsum Wallboard: Latex-fill minor defects. Sand smooth when dry. Spot prime repair areas.

D. Ferrous Metal:
   1. Clean and prepare surface profile in accordance with applicable SSPC specifications:
      a. Interior metal: SSPC-SP 2 Hand Tool Cleaning, SSPC-SP 3 Power Tool Cleaning.
      b. Exterior metal: SSPC-SP 6 Commercial Blast Cleaning,
      c. Exterior metal (field touch-up): SSPC-SP 11 Power Tool Cleaning to Bare Metal.
   2. Before hand or power tool cleaning, remove visible oil, grease, soluble welding residue, and salts by SSPC-SP 1 Solvent Cleaning. After hand or power tool cleaning, reclean surfaces if necessary.
   3. Where commercial, near-white, or white metal abrasive blast cleaning is employed, apply first coat before rust-back occurs. Do not allow prepared surfaces to sit overnight without coating.
   4. Before touching up coatings damaged by handling or welding, re-prepare damaged surfaces to original specification.
      a. Where abrasive blast cleaning or pickling was used for original preparation, either blast clean to original specification or prepare surface to SSPC-SP 11 Power Tool Cleaning to Bare Metal.

3.04 MIXING AND THINNING

A. Remove and discard any skin formed on surface of coatings in containers. Discard any containers where skin comprises 2 percent or more of the remaining material.

B. Combine multi-component paints in quantities needed for use within the manufacturer's recommended pot life at the anticipated application temperatures. Discard remaining mixed material after pot life has expired.

C. Do not add thinner except as specifically recommended (not merely permitted) by the coating manufacturer for proper coating application under the circumstances prevailing at the project site when application equipment recommended by the coating manufacturer is employed. Use only the quantities and the types of thinner recommended.

D. Mix materials using mechanical mixers in accordance with coating manufacturer's instructions. Agitate mixed materials during application if recommended by manufacturer.

E. Strain pigmented coatings after mixing except where mechanical application equipment is provided with effective strainers.

3.05 APPLICATION

A. General:
   1. Metal Surfaces Exposed to View: Apply coatings using brush or spray, only. Roller application not permitted.
   2. Full, uniform coverage is required.
   3. Employ only application equipment that is clean, properly adjusted, in good working order, and of the type recommended by the coating manufacturer.
   4. Apply successive coats after adequate cure of the preceding coat and within the recommended recoating time.

B. Film Thickness: Apply each coat to achieve the dry film thickness (dft) in mils per coat indicated in the schedule at the end of this section. Application rates of excess thickness and fewer numbers of coats than specified will not be accepted.
   1. The dry film thicknesses shown in the schedule are per each coat.
   2. Where a thickness range is specified, the dry film thickness actually applied shall fall within the specified range when measured at any point, and the average dry film thickness actually applied to the entire surface shall be equal to the midpoint of the range specified plus or minus 10 percent.
   3. Where a single thickness value is specified, the dry film thickness actually applied, when measured at any point, shall be equal to the specified value plus or minus 10 percent.

C. Prime, First, or Bottom Coats:
   1. Ferrous and Nonferrous Surfaces:
      a. Unless specifically indicated otherwise (in this section or in the respective metal section of the Specification), the first coat of material may be either shop or field applied.
      b. Shop or field applied coatings, including primers, intermediate coats, and finish coats, shall be as specified in this section. Unless specifically indicated otherwise, fabricator's standard shop coats will not be accepted, and if applied, shall be removed, the surface prepared anew, and the coatings specified herein applied.
      c. Where fabricator's standard shop primer is permitted to remain (e.g. steel doors and frames), apply one full field coat of the primer specified in this section.
      d. Ferrous metals that have not been shop primed shall be field primed promptly after arrival at the site or shall be stored away from the effects of weather.
   2. Either before or after applying prime coat but before applying successive coats, stripe paint edges, corners, mechanical fasteners, and welds using specified primer.
   3. Before applying successive coats, touch-up connections, fasteners, and damaged areas using specified primer.
   4. Where first coat shows signs of suction spots or poorly sealed areas, reapply first coat material to adequately seal surface before proceeding with intermediate and top coats.

D. Miscellaneous:
   1. Completed coatings shall be free of defects such as runs, sags, lap or brush marks, holidays, and skips.

2. Apply coatings according to the schedule at the end of this section and as otherwise indicated. Coat all similar surfaces not specifically mentioned unless specifically exempted.
3. Coat front and back of miscellaneous items such as covers, access panels, and grilles.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of permanently fixed equipment or furniture, paint surfaces behind permanently fixed equipment or furniture with primer only.

E. Apply coatings to match approved mock-ups.

F. Remove coatings not in compliance with this specification, reclean and re-prepare surfaces as specified, and apply coatings to comply with the contract documents.

3.06 JOINTS

A. Control and Expansion Joints in Floors, Walls, and Ceilings: Before installing backer rod and joint sealant specified in Division 07, apply coating to the joint face, approximately 1/2 inch deep, and allow to cure.

B. Fillet Joints between Hollow Metal Door Frames and Adjacent Walls (and similar locations): Apply coatings and allow to cure before installing joint sealant (and backers) specified in Division 07.

3.07 CLEANING

A. Clean work area on a daily basis; dispose of spent materials and empty containers. If requested, turn over to the Architect all empty coatings containers used during the course of each day.

B. Remove all trace of coatings inadvertently applied to adjacent surfaces not scheduled to be coated. Remove by appropriate methods that do not damage surfaces.

3.08 DEMONSTRATION AND INSTRUCTION

A. Instruct Owner's personnel in methods of touch up painting of interior epoxy coatings.

3.09 PROTECTION

A. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.

B. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.
1. Touch-up of minor damage will be acceptable where, in the opinion of the Architect, the result is not visibly different from surrounding surfaces. Recoat entire surface where result is different either in color, sheen, or texture.

3.10 PRIMER, INTERMEDIATE, AND TOP COAT COLORS

A. Except where coating materials cannot be tinted, tint each successive (primer, intermediate, top) coat of paint a sufficiently contrasting color to facilitate identification of complete coating coverage. The preceding coat may be in the same color family, but shall be noticeably different. Provide additional top coats without change in Contract Price if necessary to achieve complete hiding and uniform sheen.

B. Top coat colors are indicated on the drawings and schedules. For approval of actual colors, see sample and mock-up requirements specified above.

C. Top Coat Colors:
1. Before submitting samples for approval and before purchasing project quantities of material, confirm with the Architect that colors have not changed based on awarded flooring, tile, and countertop finishes.
2. Match the colors indicated on the Finish Schedule.
3. High Performance Coating 1 (HPC1); Match SW 7004 Snowbound.

D. Top coat colors of manufacturers listed on the Finish Schedule (or elsewhere) indicate the required color, only, and do not indicate the required brand name product, which shall be as specified below.

3.11 SCHEDULE

A. FLUORO-URETHANE COATINGS ON METALS
   1. System Description:
      a. Epoxy primer.
      b. Epoxy or urethane intermediate coat.
      c. Fluoro-urethane polymer top coat.
   2. Tnemec:
      a. Primer: Series N69 Hi-Build Epoxoline II, DFT 2.0 to 3.0 mils. (285 g/l)
      b. Intermediate Coat: Series 73 Endura-Shield, DFT 2.0 to 3.0 mils. (378 g/l)
      c. Low Gloss (satin) Finish Coat: LFM material designation of Finish Schedule.
         1) Series 1072 Fluoronar, DFT 2.0 to 3.0 mils. (316 g/l)
   3. Carboline:
      a. Primer: Carboguard 893SG, DFT 3.0 to 5.0 mils. (336 g/l)
      b. Intermediate Coat: Carbothane 133MC, DFT 3.0 to 5.0 mils. (97 g/l)
      c. Low Gloss (satin) Finish Coat: LFM material designation on Finish Schedule.
         1) Carboxane 950 Satin, DFT 2.0 to 3.0 mils. (420 g/l pigmented)
   4. PPG:
      a. Primer: Coraflon ADS Epoxy Primer ADS 573, DFT 2.0 to 3.0 mils. (227 g/l)
      b. Intermediate Coat: Pitthane High Build Urethane 95-8800, DFT 2.0 to 3.0 mils. (291.6 g/l)
      c. Low Gloss Finish Coat: LFM material designation on finish schedule.
         1) Coraflon ADS Intermix Satin, DFT 1.5 to 2.0 mils.

B. WATER-BASED COATINGS ON INTERIOR WALLS AND CEILINGS.
   1. Apply coatings indicated for walls to all vertical surfaces in the space (e.g. columns, other vertical surfaces, etc.).
   2. Apply coatings indicated to ceilings to all overhead surfaces (e.g. soffits, fascia, beams, etc.).
   3. Apply coatings to miscellaneous surfaces in the space (e.g. steel doors and frames, steel piping and conduit, non-ferrous piping and conduit, PVC piping, ductwork, etc.).
   4. In the case of steel doors and frames, apply coatings to the "room-side" and to the "opposite-side" of the door and frame.
   5. System(s):
      a. Gypsum Board Walls:
         1) Primer.
         2) Two top coats.
      b. Gypsum Board Ceilings:
         1) Primer.
         2) Two top coats.
      c. Galvanized Metal Deck:
         1) Steel primer.
         2) Two top coats.
      d. Structural Steel And Miscellaneous Steel:
         1) Steel primer.
         2) Two top coats.
      e. Steel Doors And Frames:
         1) Universal primer (apply 1 coat over manufacturer's standard shop primer).
         2) Two top coats.
      f. Non-Ferrous Metals:
         1) Steel primer.
         2) Two top coats.
      g. PVC or Other Plastics:
         1) Surface preparation and primer as recommended by coatings manufacturer.
         2) Two top coats.

h. Other Miscellaneous Substrates:
1) Surface preparation and primer as recommended by coatings manufacturer.
2) Two top coats.

6. Tnemec:
a. Primers:
1) Gypsum Wallboard Primer:
(a) Series 151 Elasto-Grip FC, DFT 1.0 to 2.0 mils. (170 g/l)
2) Universal Primer:
(a) One full field coat of Series 135 Chembuild, DFT 3.0 to 4.0 mils. (139 g/l)
3) Steel Primer:
(a) Series L69 Hi-Build Epoxoline II, DFT 2.0 to 3.0 mils. (98 g/l)
b. Top Coats:
1) Low Gloss (Satin) Waterborne Epoxy: LWE material designation on Finish Schedule.
(a) Series 113 H.B. Tneme-Tufcoat, DFT 4.0 to 6.0 mils. (228 g/l)

7. Carboline:
a. Primers:
1) Gypsum Wallboard Primer:
(a) Carbocrylic 120, DFT 1.0 to 2.0 mils. (98 g/l)
2) Universal Primer:
(a) One full field coat of Carboguard 890VOC, DFT 4.0 to 6.0 mils. (100 g/l)
3) Steel Primer:
(a) Carboguard 890 VOC, DFT 4.0 to 6.0 mils. (100 g/l)
b. Top Coats:
1) Low Gloss (Semi-gloss) Waterborne Epoxy: LWE material designation on Finish Schedule.
(a) Sanitile 255, DFT 2.0 to 3.0 mils. (156 g/l)

8. PPG:
a. Primers:
1) Gypsum Wallboard Primer:
(a) Seal Grip 100% Acrylic Universal Primer 17-921, DFT 1.2 to 1.5 mils. (84 g/l)
2) Universal Primer:
(a) One full field coat of PittGuard DTR Epoxy Coating 97-145, DFT 4.0 to 7.0 mils. (128 g/l)
3) Steel Primer:
(a) PittGuard DTR Epoxy Coating 97-145, DFT 2.0 to 3.0 mils. (128 g/l)
b. Top Coats:
1) Low Gloss (Semi-gloss) Waterborne Epoxy: LWE material designation on Finish Schedule.
(a) PPG Aquapon WB EP, DFT 2.0 to 4.0 mils. (126 g/l)

END OF SECTION

SECTION 10 11 01 - VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Factory Assembled Units:
      a. Markerboards.
   2. Writeable Glass Markerboards.
   3. Writeable Decorative Glass Markerboards.

B. Alternates: Work of this Section is affected by an Alternate. Refer to Section 01 23 00 - Alternates.

1.02 REFERENCES

A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's data on products specified.
   1. Include cross-section details showing each type of product and components; trim, marker/chalk tray, face, core, backing materials and thickness, and key to elevations.

B. Verification Samples: Submit three samples 2 x 2 inches (50 x 50 mm) in size illustrating materials, finish, color, and texture of each product specified.

C. Manufacturer's printed installation instructions.

D. Maintenance Data: Manufacturer's cleaning and maintenance instructions covering both routine and long-term operations.

E. Shop Drawings:
   1. Include types of units provided, location within each room, and size of each unit.
   2. Include dimensioned elevation drawings of each board assembly indicating joint locations and type of joint where required, and board mounting distances from floors.
   3. Show locations and quantities of accessories.
   4. Show anchorage and installation details.

F. Warranty.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain visual display boards of each type from a single source.

1.05 WARRANTY

A. Provide lifetime warranty for porcelain enamel steel markerboard and chalkboard writing surfaces when installed in accordance with manufacturer's instructions.

B. Warranty shall cover replacement of defective boards due to discoloration, excessive fading color, crazing, cracking or flaking. Warranty does not cover the cost of removal or reinstallation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Markerboards:
   1. Claridge Products: www.claridgeproducts.com.
   2. Platinum Visual Systems: www.pvsusa.com.
   3. Corona Group: coronagroupinc.com.

B. Writeable Glass Markerboards:
   1. Basis of Design: Clarus Glassboard LLC.: www.clarusglassboards.com.
   2. Corona Group Inc.: www.coronagroupinc.com.
   3. Dreamwalls: dreamwalls.com.

2.02 MATERIALS

A. Writing Surface: ASTM A424/A424M, Type I, Porcelain enamel on steel.
   1. Metal Face Sheet Thickness: 24 gauge, 0.024 inch (0.61 mm).
   2. Hardboard Face Sheet Thickness: 1/4 inch (6 mm).

B. Core:
   1. Single Unit Core: Particleboard laminated to face sheet.
   2. Spliced Unit Core: MDF laminated to face sheet.
   3. Backing: 0.005 inch (0.13 mm) thick aluminum foil, laminated to core.

C. Frame: T5 tempered 6063 alloy extruded aluminum, with concealed fasteners.

2.03 FACTORY ASSEMBLED UNITS

A. Factory-assembled units in a single frame, of materials specified above.
   1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
   2. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
   3. Configuration: As indicated on drawings.

B. Products:
   1. Basis of Design: Claridge Products: Series 8
      a. Standard size units: Series 8 with LCS Porcelain Enamel Steel face.
      b. Custom sizes (10 11 01.MB): Arise Whiteboard with LCS Porcelain Enamel Steel face.
      c. Markerboard: Gloss finish; Color White
   2. Platinum Visual Systems: DTS.
      a. Markerboard: Gloss finish; Color 454 Bright White.
   3. Corona Group: Framed: Elements; Frameless: Merge.
      a. Markerboard: Gloss finish; Color White.

2.04 FACTORY ASSEMBLED UNIT FABRICATION

A. Laminate facing sheet and backing sheet to core material under pressure, using manufacturer's recommended adhesive.

B. Where butt jointed spliced panels are required use MDF core.

C. Provide factory-assembled visual display boards, except where sizes demand partial field assembly.

D. Assemble units in one piece without joints, wherever possible. Where required dimensions exceed maximum panel size available, provide two or more pieces of equal length, as indicated on approved shop drawings. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

2.05 WRITEABLE GLASS MARKERBOARD MATERIALS

A. Fixed, Glass, Dry-Erase Markerboards (GM):
   1. Basis of Design: Clarus Glassboard LLC; Float.
   2. Size: As indicated on Drawings.
   3. Components:
      a. Glass: ¼ inch thick, tempered, Clarus Opti-Clear finish.
      b. Polish, polished eased edges on all four sides.
      c. Magnetic.
      d. Color: CBC-105.
   4. Concealed: Clarus Trumount Brackets.
   5. Shop fabricated.
   6. Meets BIFMA standards for horizontal pull test, vertical load test and vertical creep (long term static load) test.

B. Fixed, Glass, Decorative Dry-Erase Markerboards (DGM):

1. Basis of Design: Clarus Glassboard LLC; Float.
2. Size: As indicated on Drawings.
3. Components:
   a. Glass: ¼ inch thick, tempered, Clarus Opti-Clear finish.
   b. Polish, polished eased edges on all four sides.
   c. Magnetic.
   d. Color: Custom color to match SW 6227 Meditative.
4. Concealed: Clarus Trumount Brackets.
5. Shop fabricated.
6. Meets BIFMA standards for horizontal pull test, vertical load test and vertical creep (long term static load) test.

2.06 ACCESSORIES:

A. 10 11 01.MH; Marker Holder at all boards.
   1. Basis of Design: Walltalkers AMCM magnetic caddy holding markers and erasers.
      a. Finish: Silver.
   2. Presentation Starter Kits: Provide one starter kit contianing 10 dry erase markers, two erasers, 10 cleaning towels, and one 8 ounce bottle liquid surface cleaning solution for each area installed with porcellain board or glassboard.
   3. Refer to Drawings for locations of marker boards. Provide one marker holder for each individual board.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by manufacturer.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 11 46 - VISUAL DISPLAY FABRICS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dry erase wallcovering.

B. Dry erase projection wallcovering.

C. Accessories.

1.02 REFERENCES

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

B. GA-214 - Levels of Finish for Gypsum Panel Products; 2021.

1.03 SUBMITTALS

A. Manufacturer’s product data for each type of dry erase wallcovering, adhesive and accessories required.

B. Manufacturer's written installation instructions.

C. Samples:
   1. 7 x 9 inches (175 x 230 mm) samples of each dry erase material required.
   2. 6 inches (150 mm) samples of trim, tray and end caps required.

D. Closeout Submittals: Warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer: Provide each type of dry erase wallcovering required produced by one manufacturer.

B. Applicator: Installation by skilled commercial wallcovering applicators with no less than three years of documented experience installing dry erase wallcovering of the types and extent required.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver presentation wallcoverings to the project site in unbroken and undamaged original factory wrappings and clearly labeled with the manufacturer's identification label, quality or grade, and lot number.

B. Store materials in a clean, dry storage area with temperature maintained above 55 deg F (13 deg C) with normal humidity.

C. Store material in a flat position to prevent damage to roll ends. Do not cross stack material. Support material off the floor in a manner to prevent sagging and warping.

1.06 PROJECT CONDITIONS

A. Do not apply presentation wallcoverings when surface and ambient temperatures are outside the temperature ranges required by the wallcovering manufacturer.

B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 55 deg F (13 deg C) unless required otherwise by manufacturer's instructions.

C. Apply adhesive when substrate surface temperature and ambient temperature is above 55 deg F (13 deg C) and relative humidity is below 40 percent.

D. Maintain constant recommended temperature and humidity for at least 72 hours prior to and throughout the installation period, and for 72 hours after wallcovering installation completion.

E. Provide not less than an 80 foot-candles (861 Lux) lighting level measured mid-height at substrate surfaces.

1.07 WARRANTY

A. Submit manufacturer's limited five-year written warranty against manufacturing defects.

1.08 MAINTENANCE

A. Maintenance instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Requirements for all wallcovering:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

B. Dry erase wallcoverings (D): Moderate gloss vinyl surface for dry erase markers, woven backing.
   1. Product:
      a. Basis of Design: koroseal Walltalkers, Just-Rite 60 JR60-00: 60 inches (1,524 mm) width.
      b. MDC, Dry Erase Wallcovering DEW15101: 60 inches (1,524 mm) width.
      c. Momentum, Source One, Write Away Dry Erase Only: 60 inches (1,524 mm) width.
      d. Color: White.

C. Dry erase projection wallcoverings (DP): Smooth low gloss vinyl surface for projection and dry erase markers.
   1. Product:
      a. Basis of Design: Walltalkers Matte-Rite 60, MP60-00: 60 inches (1,524 mm) width, 17 ounces per square yard (576.4 g/sq m), non-woven backing.
      b. MDC, Low Glare Dry Erase Wallcovering DEW15202: 60 inches (1,524 mm) width.
      c. Momentum, Source One, Write Away Dry Erase & Projection Capable: 60 inches (1,524 mm) width.
      d. Color: White.

2.02 ACCESSORIES

A. Adhesives: Heavy-duty clear premixed vinyl adhesive or clay based adhesive.

B. Substrate Primer/Sealer: White pigmented acrylic base primer/sealer specifically formulated for use with vinyl wallcoverings.
   1. Primer: Use pigmented primer on deep colored walls and walls with contrasting colors.

C. Basis of Design for Product Numbers listed below: Walltalkers.

D. Aluminum Trim, 1/4 inch (6 mm) wide: (AJT):
   1. Product:
      a. JCAP: Clear anodized aluminum.

E. Aluminum Marker and Eraser Caddy (AME):
   1. Product:
      a. AMC1: Silver Caddy, marker and eraser caddy.
      b. Refer to Drawings for locations of visual display wallcovering. Provide one marker holder for each individual board.

F. Markers, Erasers and Cleaners:
   1. Presentation Starter Kits: Provide one starter kit containing eight dry erase markers, two erasers, 10 cleaning towels, and one 8 ounce (235 ml) bottle liquid surface cleaning solution for each room installed with dry erase wallcovering.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 5 finish, GA-214, Recommended Levels of Gypsum Board Finish.
   1. Test substrates with a suitable moisture meter and verify that moisture content does not exceed 4 percent.
      a. Verify substrate surfaces are clean, dry, smooth, structurally sound and free from surface defects and imperfections that would show through the finished surface.
      b. Evaluate all painted surfaces for the possibility of pigment bleed-through.
      c. Notify the Architect in writing of any conditions detrimental to the proper and timely completion of the installation.
      d. Beginning of installation means acceptance of surface conditions.

3.02 INSTALLATION

A. Acclimate wallcovering in the area of installation a minimum of 24 hours before installation.

B. Examine all materials for pattern, color, quantity and quality as specified for the correct location prior to cutting.

C. Use specified adhesive.

D. Install dry erase wallcovering panels in exact order as they are cut from bolt. Reverse hang alternate strips. Do not crease or bend the wallcovering when handling.

E. Install dry erase wallcovering horizontally using a level line. Using level or straight edge, double cut the seam with a new razor or knife. Install bottom edge at 32 inches above finish floor unless otherwise indicated.

F. When covering the entire wall, seam the material out of the main writing and viewing areas of the wall.

G. Smooth wallcovering to the hanging surface using a wallcovering smoother, wrapped with a soft cloth, to eliminate air bubbles, wrinkles, gaps and overlaps. Do not use sharp edged smoothing tools. Smooth material on the wall from the middle to the outside edge.

H. Remove excess adhesive along finished seams immediately after each wallcovering strip is applied. Clean entire surface with warm, mild soap solution, a natural sponge and clean towels. Rinse thoroughly with water and let dry before using. Change water often to maintain water cleanliness.

I. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

J. Install trim in accordance with manufacturer's instructions on bottom edge and on side edges where edges do not extend to corner of wall.
   1. J-Cap or J-Trim: Feather drywall compound trim edge to provide smooth surface transition from drywall backing to highest point on long leg of metal edge trim.

K. Install marker caddy just above wallcovering trim at either end of wallcovering.

3.03 CLEAN-UP

A. Upon completion of installation, remove all exposed adhesive immediately using a natural sponge and a warm, mild soap solution and rinse thoroughly with water and dry with clean towel prior to using.

B. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the wallcovering installation. Leave areas in neat clean and orderly condition.

END OF SECTION

SECTION 10 11 47 - TACKABLE WALLCOVERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient cork tackable wallcovering.

B. Accessories.

1.02 REFERENCES

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

1.03 SUBMITTALS

A. Product data.

B. Installation and maintenance instructions.

C. Samples: 6 x 9 inch (150 x 230 mm) samples of each tackable material required.

1.04 QUALITY ASSURANCE

A. Mockup: Prepare field samples for Architect's review and establish requirements for seaming and finish trim.
   1. Maintain corrected and approved samples to serve as a standard of performance for the project.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original factory wrappings and containers, clearly labeled with manufacturer, brand name, and fire hazard classification.

B. Store materials in original, undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within the storage area at not less than 70 deg F (21 deg C) during the period materials are stored.

1.06 PROJECT CONDITIONS

A. Maintain ambient temperature within the building at not less than 68 deg F (20 deg C) for a minimum of 72 hours prior to beginning of installation.

B. Do not install tackable wallcovering until the space is enclosed and weatherproof.

C. Do not install tackable wallcovering until temperature is stabilized and permanent lighting is in place.

1.07 MAINTENANCE

A. Maintenance instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.01 VOLATILE ORGANIC COMPOUNDS

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants.
   1. Multipurpose Construction Adhesives: 70 g/l.

2.02 MATERIALS

A. Requirements for All Wall Coverings:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

2.03 TACKABLE WALLCOVERING

A. Tackable Wallcovering: Uni-color, linoleum resilient homogeneous tackable surface consisting of linseed oil, granulated cork, rosin binders and dry pigments calendared onto natural burlap backing. Color shall extend through thickness of material.
   1. Basis of Design: Koroseal Interior Products; Walltalkers Tac-Wall; www.koroseal.com.
   2. Forbo; Bulletin Board; www.forbo.com.
   3. MDC Interior Solutions; Natural Cork; www.mdcwall.com.

B. Color:
   1. Color 1 (TW1): Deep Sea.
   2. Color 2 (TW2): Harbor.

2.04 ACCESSORIES

A. Aluminum J Trim, clear anodized aluminum.
   1. Width: 5/16 inch (8 mm).
   2. Basis of Design: Tac-wall XXJT.

B. Adhesives: Heavy-duty clear premixed vinyl adhesive or clay based adhesive.

C. Substrate Primer/Sealer: White pigmented acrylic base primer/sealer specifically formulated for use with vinyl wallcoverings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which tackable wallcoverings will be installed.
   1. Complete finishing operations, including painting, before beginning installation of tackable wallcovering materials.
   2. Wall surfaces to receive wallcovering materials shall be dry and free from dirt, grease, loose paint, and scale.
   3. Do not proceed with installations until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Remove hardware, accessories, plates and similar items to allow tackable wallcovering to be installed.
   1. Gypsum board surface: Recess nails and screws. Repair irregular tape joints, sand and remove dust. Ensure gypsum wallboard surfaces scheduled to receive wallcovering are properly primed under Section 09 91 00.

B. Prime substrate as recommended by manufacturer.

3.03 INSTALLATION

A. Comply with manufacturer’s installation instructions.

B. Apply adhesive with 1/16 inch (1.5 mm) trowel to area to receive sheet.

C. Work from top to bottom then side to side. Roll sheet firmly into adhesive for positive contact and to remove air bubbles.

D. Remove adhesive residue immediately.

E. Scribe, cut, and fit material to butt tightly to adjacent surfaces, built-in casework, and permanent fixtures and pipes.

F. Lap and double cut seams.

G. Butt joint.

H. Install tray and trim in accordance with manufacturer's instructions.

3.04 CLEAN-UP

A. Upon completion of installation, remove exposed adhesive immediately using a natural sponge and a warm, mild soap solution. Rinse thoroughly with water and dry with clean towel prior to using.

END OF SECTION

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

B. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

C. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

D. Verification Samples: Submit samples showing colors and finishes specified.

PART 2 PRODUCTS

2.01 DIMENSIONAL LETTERS

A. Applications: Building identification and branding.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Stainless steel sheet, fabricated reverse channel.
   2. Thickness: 1/8 inch minimum (3 mm).
   3. Letter Height: As indicated on drawings.
   4. Text and Typeface:
      a. Character Font:
         1) Building letter: Avenir Book.
         2) Building address: Avenir Light.
   5. Finish: Brushed, satin.
   6. Mounting: Stainless steel stand-off pins.

2.02 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work including required in-wall blocking.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

END OF SECTION

SECTION 10 14 23 - PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

B. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

C. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

D. Verification Samples: Submit samples showing colors, materials, and finishes specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. APCO: www.apcosigns.com.
   2. Best Sign Systems, Inc: www.bestsigns.com.
   3. FASTSIGNS International, Inc: www.fastsigns.com.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. General: Comply with requirements of Wake Tech Signage Standards.
   2. Application: Room and door and directional signs.
   3. Description: Flat signs with applied character panel media, tactile characters.
   4. Sign Size: As indicated on drawings.
   5. Sign Edges: Squared.
   6. Corners: Squared.
   7. Color and Font, unless otherwise indicated:
      a. Character Font: Avenir Book.
      b. Character Case: Upper and lower case (title case).
      c. Background Color: Pantone 302C.

d. Character Color: Contrasting color.

8. Material: Acrylic plastic base with applied plastic letters and braille.
9. Profile: Flat panel without frame.
10. Tactile Letters: Raised 1/32 inch minimum.
11. Braille: Grade II, ADA-compliant.
12. One-Sided Wall Mounting: Tape adhesive.
13. Mounting on Glazing: Provide matching backer panel on opposite side of glazing.

2.04 SIGNAGE APPLICATIONS

A. Sign Types as indicated in Drawings.

B. Room and Door Signs:
1. Office Doors: Sign Type B; Identify with room names and numbers to be verified with Owner; provide "window" section for replaceable occupant name.
2. Conference and Meeting Rooms: Sign Type A; Identify with room names and numbers to be verified with Owner.
3. Classrooms and Labs: Sign Type C; Identify with the room names and numbers to be verifed with Owner; provide "window" section for replaceable insert.
4. Service Rooms: Identify with room names and numbers to be verified with Owner.
5. Toilet Rooms: Sign Type D; Identify with pictograms, the names "MEN" and "WOMEN", and braille.
6. Stairs: Sign Type F.1 (corridor side of door); Sign Type F.2 (stair landing).

C. Interior Directional and Informational Panel Signs:
1. Types and locations as indicated on Drawings.

D. Emergency Evacuation Map Panel Signs:
1. Sign Type E; provide "window" section for replaceable insert.
2. Allow for one map per elevator lobby.
3. Map content to be provided by Owner.

2.05 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION

SECTION 10 14 30 - MONUMENTAL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building mounted monumental signage.

B. Illumination system.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
   2. Show locations of electrical service connections.
   3. Include diagrams for power, signal, and control wiring.

B. Verification Samples: Submit three samples for each color and finish selected.

C. Delegated Design: For illuminated monumental signage at screen wall, provide structural design stamped by Professional Engineer licensed in the State of North Carolina for letters, logo, support framing, and attachments to supporting structure.

PART 2 PRODUCTS

2.01 CUSTOM-FABRICATED ILLUMINATED MONUMENTAL SIGNAGE

A. Applications: Building identification and branding.
   1. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters and Logos:
   1. Material: 3” deep fabricated aluminum channel letters with shoulders for trimless white acrylic faces with surface applied digitally printed graphics on clear vinyl.
   2. Thickness: 0.04 inch minimum (1 mm).
   3. Letter Height: As indicated on drawings.
   4. Finish: PVDF coating.
   5. Color: Custom colors as selected by Architect.
   6. Mounting: mechanically fastened (through bolted) to cold formed framing attached to screen wall structural steel with stainless steel hardware.
   7. Illumination System: Face-lit channel letters.
      a. LED lghting for facelit illuminated letters and logo to be integrated into signage and wired to disconnect switch on back of screen wall. Fabricator to provide UL-listed power supplies in exterior-rated cabinet and wiring as required to provide power to lighting.
      b. Provide products that are listed and labeled as complying with UL 879, where applicable.
      c. Power: As indicated on Drawings.

2.02 CUSTOM-FABRICATED BACKLIT SIGNAGE

A. Applications: Building identification and branding.
   1. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters and Logos:
   1. Material: Aluminum sheet, flat.
   2. Thickness: 1/8 inch minimum (3 mm).
   3. Water jet cut, graphic as indicated in Drawings.

4. Finish: PVDF coating.
5. Color: Custom colors as selected by Architect.
6. Mounting: Stainless steel stand-off pins.
7. Illumination System: Backlit graphic.
    a. LED lghting to be integrated into signage and wired to disconnect switch indicated on Drawings. Fabricator to provide UL-listed power supplies and wiring as required to provide power to lighting.
    b. Provide products that are listed and labeled as complying with UL 879, where applicable.
    c. Power: As indicated on Drawings.

2.03 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel.

B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70 by a qualified testing agency.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work including required in-wall blocking.

B. Verify that electrical service is correctly sized and located to accommodate lighting incorporated into signage.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Toilet compartments.

B. Urinal screens.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.04 SUBMITTALS

A. Product Data: Provide data on panel construction, hardware, and accessories.

B. Samples: Submit three samples of partition panels, 8 x 8 inch (203 x 203 mm) in size illustrating panel finish, color, and sheen.

C. Manufacturer's Installation Instructions: Indicate perimeter conditions requiring special attention.

D. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

1. Include concealed steel supports and anchors.
2. Delegated design: Shop drawings for concealed steel supports and anchors shall be prepared and sealed by a Professional Engineer licensed to practice in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Toilet Compartments:

1. General Partitions Mfg. Corp: www.generalpartitions.com.
2. Global Steel Products Corp: www.globalpartitions.com.
3. Metpar Corp: www.metpar.com.

2.02 GENERAL REQUIREMENTS

A. Manufacturer shall ensure that accessible units comply with ADA Standards in every respect.

2.03 METAL MATERIALS AND COMPONENTS

A. Stainless Steel Sheet: ASTM A666, Type 304.

B. Toilet Compartment Suspension: Ceiling-Hung.

C. Pressure bond sheet steel faces to sound deadening core, formed and closed edges; corners made with corner clips or mitered, welded, and ground smooth.

1. Panel Faces: 20 gauge (0.9 mm).
2. Door Faces: 22 gauge (0.8 mm).
3. Pilaster Faces: 20 gauge (0.9 mm).
4. Reinforcement: 12 gauge (2.5 mm).
5. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.

D. Door and Panel Dimensions:

1. Thickness: 1 inch (25 mm).
2. Door Width: 24 inch (610 mm).

3. Door Width for Handicapped Use: 36 inch (914 mm) wide, out-swinging.
4. Height: 58 inch (1,473 mm); locate bottom edge 12 inches (310 mm) above finish floor.

E. Urinal Screens: Wall mounted with continuous panel brackets.

F. Pilasters: 1-1/4 inch (32 mm) thick, of sizes required to suit compartment width and spacing.

G. Brackets: Polished chrome-plated non-ferrous cast metal.

2.04 METAL PANEL FINISHING

A. Stainless Steel Panels: No. 4 finish.

2.05 ACCESSORIES

A. Support Steel: Design and provide concealed support steel necessary for anchoring compartments and screens.
1. Design Loads: Design each support and attachment to resist imposed dead load plus each of the following, applied individually:
a. Concentrated live load of 300 lbs (136 kg) applied vertically (downward) at any point on the panel.
b. Concentrated live load of 200 lbs (91 kg) applied horizontally at any point on the panel.

B. Pilaster Shoes: Formed chromed steel with polished finish, 3 inch (76 mm) high, concealing floor and ceiling fastenings.
1. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

C. Attachments, Screws, and Bolts: Stainless steel, tamper proof.

D. Hardware: Polished chrome plated non-ferrous cast metal:
1. Continuous hinges.
2. Thumb turn or sliding door latch with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.
6. Provide complete ADA compliant hardware for accessible units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions before starting work.

B. Verify that field measurements are as indicated.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch (10 to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 26 01 - WALL PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.03 SUBMITTALS

A. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

1.04 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project:
   1. Corner-Guard: Full-size corner guard of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, full height long units.
   2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards: CG1 and CG2
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties, Inc; Stainless Steel Corner Guards: www.c-sgroup.com. Comparable products may be provided by the manufacturers listed below:
      a. Inpro: www.inprocorp.com.
      b. Koroseal Interior Products: www.koroseal.com.
      c. Life Science Products, Inc.: www.lspinc.com.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Corner Guards - Flush Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish, 14-gauge thick.
   2. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
   3. Products:
      a. CG1: CO-8, 3-inch (76-mm) wings.
      b. CG2: SCO-8, 2-inch (51-mm) return legs.
   4. Corner: Square.
   5. Length: One piece, 6-0" (1829-mm).

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches (102 mm) above finished floor to 96 inches high (2438 mm high).

END OF SECTION

SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

D. Utility room accessories.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

E. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com.
   2. Bobrick: www.bobrick.com.
   3. Bradley Corporation: www.bradleycorp.com.
   4. Basis of Design manufacturer noted for each item below.

2.02 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel.
   1. Products:
      a. OFOI.

B. Laboratory Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 400 C-fold minimum.
   2. Products:
      a. Basis of Design: Bobrick B-262.

C. Toilet Room Paper Towel Dispenser: Manual, roll paper type.
   1. Mounting: Surface mounted.
   2. Products:
      a. OFOI.

D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with plastic cover and working parts; push type soap valve, check valve, and window gauge refill indicator.
   1. Products:
      a. OFOI.

E. Hand Sanitizer Dispenser: Wall-mounted.
   1. Products:

a. OFOI.

F. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: 18 inches by 36 inches.
3. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

G. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
1. Products:
a. OFOI.

H. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.

I. Combination Sanitary Napkin/Tampon Dispenser: Stainless steel, surface-mounted.
1. Products:
a. OFOI.

J. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. OFOI.

K. Wardrobe Hook: Aluminum with exposed fasteners.
1. Products:
a. Basis of Design: Grainger 4JG66.

L. Shelf: Stainless steel, surface-mounted, 18 inches long.
1. Products:
a. Basis of Design: Grainger 4WMK4.

2.03 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch (3.2 mm) flexible PVC.
a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
b. Comply with ICC A117.1.
4. Color: White.

2.04 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Polyethylene.
2. Mounting: Surface.
3. Color: As selected.
4. Products:

a. Basis of Design: Koala Care KB200-00.

2.05 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.
   2. Hooks: Three, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches (900 mm).
   5. Products:
      a. Basis of Design: Bobrick B-224.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.
   2. Other Accessories: As indicated on drawings.

END OF SECTION

SECTION 10 41 16 - EMERGENCY KEY CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire and Police Department access key storage.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products on which hardware is installed.

B. Furnish templates for products recess mounted in walls.

1.03 SUBMITTALS

A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

PART 2 PRODUCTS

2.01 FIRE AND POLICE DEPARTMENT LOCK BOX

A. Knox Company; Knox-Box Rapid Entry System, Knox Box 3200 Dual Lock Model: www.knoxbox.com.

B. Heavy-duty, recessed, solid steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers.

C. Capacity: Holds 10 keys.

D. Finish: Manufacturer's standard black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is ready to receive this work; and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Mounting Heights: 4 feet above adjacent walking surface.

3.03 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

3.04 PROTECTION

A. Protect finished Work

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 10 43 00 - EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs) (OFOI).

B. Automated external defibrillator (AED) cabinets (OFOI).

C. First aid cabinets (OFOI).

D. Evacuation chairs and cabinets (OFOI).

1.02 DEFINITIONS

A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA)-approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

PART 2 PRODUCTS

2.01 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS) (OFOI)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.
   1. ZOLL Medical Corporation; [AED Plus with graphical cover]: www.zoll.com.

2.02 EMERGENCY AID CABINETS (OFOI)

A. Type: First aid.

B. Cabinet Configuration: Surface mounted type, removable.

C. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

2.03 EVACUATION CHAIR (OFOI)

A. Basis of Design: Stryker Evacuation Chair 6254-000-000.
   1. Wall-mounted.
   2. Accessories:
      a. Storage cabinet 6254-002-000.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide blocking as required for cabinet installation in locations indicated in Drawings.

END OF SECTION

SECTION 10 44 00 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCES

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 PERFORMANCE REQUIREMENTS

A. Provide extinguishers classified and labeled by testing firm acceptable to the Fire Marshall for the purpose specified and indicated.

1.04 SUBMITTALS

A. Product Data.

B. Maintenance Data: Include test, refill, or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
   1. JL Industries, Inc.: www.jlindustries.com.
   2. Larsen's Manufacturing Co.: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.

2.02 FIRE EXTINGUISHERS

A. Provide units labeled by UL (DIR).

B. Dry Chemical Multi-Purpose Type: Steel cylinder.
   1. Size: 4A60BC.
   2. Diameter: 5 inches (127 mm).
   3. Finish: Powder coat, red color.

2.03 CABINETS FOR DRY TYPE MULTI-PURPOSE FIRE EXTINGUISHERS

A. Style: Vertical Duo.

B. Trim: Flat, 1 inch (25 mm)-wide face.

C. Recessed Cabinet (non-fire-rated box):
   1. Exterior nominal dimensions of 9 to 10-1/2 inches (229 to 267 mm) wide x 24 inches (610 mm) high x 6 inches (152 mm) deep.
   2. Finish: Stainless Steel.
      a. J.L.; Cosmopolitan 1035.
      b. Larsen's; Architectural SS2409-R2.
      c. Potter-Roemer; Alta SS 7060 DV.

D. Semi-recessed (non-fire-rated box):
   1. Exterior nominal dimensions of 12 inches (305 mm) wide x 27 inches (686 mm) high x 6 inches (152 mm) deep.
   2. Finish: Stainless Steel.
      a. J.L.; Cosmopolitan 1037 (3 inches (76 mm) projection).
      b. Larsen's; Architectural SS2409-6R (2-1/2 inch (64 mm) projection).
      c. Potter-Roemer; Alta SS 7062 DV (2 inch (51 mm) projection).

E. Door: 0.036 inch (0.9 mm) thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch.

F. Door Glazing: Tempered Glass, clear, 1/8 inch (3 mm) thick float. Set in resilient channel gasket glazing.

G. Finish of Cabinet Interior: White enamel.

H. Cabinet Signage: FIRE EXTINGUISHER in black vertical letters parallel to vertical-duo window.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level, at height indicated in Drawings.

C. Secure rigidly in place.

END OF SECTION

SECTION 10 51 13 - METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Locker benches.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

B. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

C. Samples: Submit three samples 3 by 4 inches (75 by 100 mm) in size showing color and finish of metal locker material.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
1. Art Metal Products: www.artmetalproducts.com/#sle.
2. ASI Storage Solutions: www.asi-storage.com.
3. DeBourgh Manufacturing Co; Apex Series Lockers: www.debourgh.com/#sle.
4. List Industries, Inc: www.listindustries.com/#sle.
5. Lockers MFG: www.lockersmfg.com.
6. Penco Products, Inc: www.pencoproducts.com.

2.02 LOCKER APPLICATIONS

A. Student Lockers: Metal lockers, wall mounted with matching closed base.
1. Width: 12 inches (305 mm).
2. Depth: 18 inches (457 mm).
3. Height: 72 inches (1830 mm).
4. Configuration: Single tier.
5. Fittings: Size and configuration as indicated on drawings.
   a. Hooks: One double prong.
6. Ventilation: Louvers at top and bottom of door panel.
7. Locking: Built-in combination locks.
8. Provide sloped top.
9. Color: To be selected from manufacturer's full range by Architect.

2.03 METAL LOCKERS

A. Accessibility: Design units indicated on drawings as "accessible" to comply with ICC A117.1 and ADA Standards.

B. Locker Case Construction:
1. Heavy-Duty, Welded Construction: Made of formed and welded together sheet steel; metal edges finished smooth without burrs; baked enamel or powder coat finished inside and out.

a. Assembly: Do not use bolts, screws, or rivets to assemble locker bodies.
b. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
1) Unperforated Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M and the following:
(a) Zinc-Coated by the Hot-Dip Process: Comply with ASTM A653/A653M, coating designation G60/Z180.
2) Body and Shelves: 16 gauge, 0.0598 inch (1.52 mm).
3) Backs: 18 gauge, 0.0478 inch (1.21 mm).
4) Base: 18 gauge, 0.0478 inch (1.21 mm).
(a) Height: 4 inches (100 mm).

C. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
1. Door Thickness: 16 gauge, 0.0598 inch (1.52 mm), minimum.
2. Form recess for operating handle and locking device.

D. Latches and Door Handles: Manufacturer's standard.
1. Latching: Manufacturer's standard for locking arrangement selected.

E. Hinges: Continuous piano hinge with powder coat finish to match locker color.

F. Sloped Top: 20 gauge, 0.0359 inch (0.91 mm), with closed ends.

G. Trim: 20 gauge, 0.0359 inch (0.91 mm).

H. Coat Hooks: Stainless steel or zinc-plated steel.

I. Number Plates: Provide oval shaped aluminum plates. Form numbers 1 inch (25 mm) high of block font style with ADA designation, in contrasting color.

J. Locks: Locker manufacturer's standard type indicated in Applications article above.

2.04 LOCKER BENCHES

A. Locker Benches: Stationary type; bench top of phenolic; painted steel pedestals.
1. Accessibility: Comply with ICC A117.1 and ADA Standards.
2. Height: 18 inch (457 mm).
3. Length: As indicated on Drawings.
a. LB1: 60 inch (1524 mm).
b. LB2: 48 inch (1219 mm).
4. Floor attachment: bolted.
5. Top finish: As selected by Architect from Manufacturer's full range of colors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds (445 N).

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

END OF SECTION

SECTION 10 71 13.43 - FIXED SUN SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Modular, shop fabricated, extruded aluminum sun screens to be mounted on curtain wall.

1.02 REFERENCE STANDARDS

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

1.03 SUBMITTALS

A. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.

B. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

C. Samples: 10 inches (254 mm) by 10 inches (254 mm) minimum illustrating design, workmanship and finish color.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform structural design under direct supervision of a Professional Engineer experienced in design of this type of work licensed in the State in which the Project is located.

1.05 WARRANTY

A. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fixed Aluminum Sun Screens:
   1. Same manufacturer as curtain wall to which sun screens are to be attached.

2.02 SUN SCREENS

A. Aluminum Sun Screen 1: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.
   1. Basis of Design: Kawneer Versoleil SunShade - Single Blade System.
   2. Configuration: As indicated on drawings.
   3. Louver Type: Airfoil.
   4. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection:
      a. As indicated on Structural drawings.

b. Thermal Movement: Plus/minus 1/8 inch (3.175 mm), maximum.

5. Sizes: As indicated on drawings.
6. Exposed Aluminum Finish: Match Glazed Aluminum Curtain Wall framing, refer to section for finish information.
7. Provide a complete system ready for erection at project site.

B. Aluminum Sun Screen 2: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.

1. Basis of Design: Kawneer Versoleil SunShade - Outrigger System.
2. Configuration: As indicated on drawings.
3. Louver Type: Tube.
4. Outrigger Shape: Wedge.
5. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection:
   a. As indicated on Structural drawings.
   b. Thermal Movement: Plus/minus 1/8 inch (3.175 mm), maximum.
6. Sizes: As indicated on drawings.
7. Exposed Aluminum Finish: Match Glazed Aluminum Curtain Wall framing, refer to section for finish information.
8. Provide a complete system ready for erection at project site.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B209/B209M or ASTM B221 (ASTM B221M).

B. Aluminum Coated Steel Sheet: ASTM A792/A792M.

C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

D. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Set units level, plumb, with uniform joints, and aligned with building elements.

C. Separate dissimilar metals using concealed bituminous paint or non-absorbent gasket.

D. Anchor units to structure as indicated on drawings.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

F. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.02 TOLERANCES

A. Maximum Variation from Level: Plus/Minus 1/8 inch (3.175 mm).

END OF SECTION

SECTION 11 52 13 - PROJECTION SCREENS

PART 1 GENERAL

1.01 SUMMARY

A. This section includes electrically operated large venue projection screen surfaces, fabrics, construction, supplemental devices, and installation and operation mechanisms and accessories.

B. Products listed in this section shall be supplied with both a screen and a roller device provided by the same manufacturer as on complete assembly and warranty.

1.02 RELATED SECTIONS

A. Rough carpentry (06 10 00)

B. Structural steel framing (05 12 00)

C. Electrical (26 00 00)

D. Communications (27 00 00)

E. Pathways for Communications Systems (27 05 26)

1.03 DEFINITIONS

A. Gain: The screen’s luminance or brightness measured perpendicular to the screen center, measured relative to block of magnesium carbonate which serves as the standard for 1.0 gain. The gain shall be measured in accordance with SMPTE RP 94-2000.

B. Half Gain Viewing Angle: The angle from the perpendicular center of the screen at which the light measured from the screen is equal to one half the values measured in the test for gain.

C. Gain Uniformity: The variation in light intensity measured perpendicular to any point on the screen as a percentage of the light intensity measured perpendicular to the center of the screen. The screen shall be illuminated uniformly by using a collimated light source as simulated by a projector and lens with a throw ratio greater than three and an f stop number greater than f4.0.

D. Ambient Light Reflectivity: The amount of light reflected from the screen from undesirable off axis sources as a percentage of the light incident on the screen. The measurement is taken perpendicular to the screen and the light source is at 45 degrees from the perpendicular. The ambient light reflectivity is an indicator of the potential screen contrast which is independent of projector contrast ratio, room illumination level or room surface reflectivity.

E. Format: Proportion of projection screen viewing area expressed as a ratio of height to width.
   1. NTSC or video format: 1.00 to 1.33
   2. HDTV Format: 1.00 to 1.78.
   3. Wide Format: 1.00 to 1.6.
   4. Square: 1.0 to 1.0.
   5. Cinemascope or Anamorphic Format: 1.00 to 2.35.
   6. Widescreen (Letterbox) Format: 1.00 to 1.85/

1.04 REFERENCES

A. The products described in this specification shall be designed and manufactured according to the latest revision of the following standards.
   1. International Code Council (ICC):
      a. International Building Code
   2. Society of Motion Picture and Television Engineers (SMPTE):
      a. MPTE RP 94-2000 – Gain Determination of Front Projection Screens
   3. National Fire Protection Association (NFPA)
      a. NFPA 701 – Standard methods of fire tests for flame propagation of textiles and films.

4. ASTM International
   a. ASTM E84 – 09 – Standard test method for surface burning characteristics of building materials.
5. Underwriters Laboratories
   a. UL94, (harmonized with IEC 60707, 60695-11-10 and ISO 9772 and (9773), the standard for safety of flammability of plastic materials for parts in devices and appliances testing.
   b. UL94 V-0
   c. UL94 5V
6. National Electric Code
   a. Article 300-22 © spaces used for environmental air.

1.05 ACTION SUBMITTALS

A. Provide in accordance with Section 01 33 00 – Submittal Procedures:

B. Manufacturers' product data for projection screens and associated devices, including installation, maintenance, and cleaning instructions.

C. Material Safety Data Sheet (MSDS)

D. Shop Drawings: Submit shop drawings. Indicate dimensions, fabrication, and installation methods and details including anchors, clamps, strut, threaded rod, and safety cables. Submit shop drawings for low voltage and high voltage wiring.
   1. Samples:
      a. Initial Selection Samples: Submit samples showing complete range of colors, textures and finishes available for each material used.
      b. Verifications Samples: Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected.
      c. Submit the following samples:
         1) Submit a sample of screen case finishes for approval.
         2) Submit a 6" by 6" sample of screen fabric for approval.

1.06 INFORMATION SUBMITTLS

A. QUALITY ASSURANCE:

B. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

C. Certifications: Product certifications signed by manufacturer certifying that materials comply with specified performance characteristics, criteria, and physical requirements.

D. Manufacturer's installation instructions.

1.07 CLOSEOUT SUBMITTALS

A. Operation and maintenance data: Submit operation and maintenance data for products in accordance with Section 01 78 00 – Closeout Submittals. Include:

B. Manufacturer's instructions and maintenance requirements.

C. Parts catalog that includes complete list of repair and replacement parts, with cuts and identifying numbers.

1.08 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

B. The manufacturers shall be engaged full time in the production of the products herein.

C. The product types specified herein shall represent at least sixty percent of the total volume of products produced by the manufacturer.

D. Contractor Qualifications:

E. The contractor shall be an authorized dealer and service facility for the products specified herein

F. The contractor shall demonstrate at least five (5) years of experience with the installation of products specified herein.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver and install the projection screens after the building is enclosed and the construction where screens will be installed is substantially complete. The HVAC system shall have been started and shall be supplying clean air. The room shall be broom clean at a minimum. If applicable, mechanical assembly shall be installed earlier with the screen properly packaged and stored elsewhere until installation conditions are met.

B. Upon receipt of the screens, inspect the screens for impressions, tears, stains, dirt, foreign matter, or other defects. Immediately notify the Manufacturer and file claims with shipping companies. Clean or repair the screens as required, as authorized by the manufacturer.

C. Waste management and disposal:

D. Separate waste materials for recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

E. Remove packaging materials from site and dispose of at appropriate recycling facilities.

1.10 PROJECT AMBIENT CONDITIONS

A. Project locations: Perform electrically operated large venue projection screen work only when temperatures are greater than 40 degrees F.

1.11 SEQUENCING

A. Sequence with other work: Comply with projection screen manufacturers' written recommendations for sequencing construction operations.

1.12 WARRANTY

A. Project warranty: Refer to contract conditions for project warranty provisions.

B. Attention is direct to provision of closeout submittals and applicable parts of Division 1 regarding warranties.

C. Manufacturers shall provide their standard warranty for work specified in this section. However, such warranty shall be in addition to and not in lieu of other liabilities which manufacturers and the contactor may have by law or by other provisions of the contract documents.

D. Screens shall be warranted by the manufacturer not to flake, peel, separate, crack, or change optical characteristics for a minimum of five (5) years from date of installation, unless subject to abuse. Mechanisms shall be warranted for five (5) years to operate smoothly, to stop consistently without need for adjustment and to maintain original noise levels.

1.13 MAINTENANCE MATERIALS

A. Use standard product line parts produced by the manufacturer of electrically operated large venue projection screens.

PART 2 PRODUCTS

2.01 MANUFACTUERES

A. Ensure manufacturers have a minimum of five (5) years of experience manufacturing components similar to or exceeding project requirements.

B. Manufacturer: Da-Lite Screen Company, Inc.:

C. Contact: P.O. Box 137, N Detroit St., Warsaw, IN 46581-0137; Telephone: (800) 622-3737, (574) 267-8101; E-mail: info@da-lite.com; website: https://www.legrandav.com/products/da-lite

2.02 PROJECTION SCREEN SYSTEM

A. Type 1: PST-E 109'' Diagonal (57 ½'' x 92'') Ceiling Recessed Projection Screen – Da-Lite Contour Electrol
   1. Screen Mounting: Ceiling Recessed
      a. Mounting Hardware: Included mounting hardware.
   2. Screen Size:
      a. Viewing area: 57 ½'' H x 92" W
   3. Acceptable Screens:
      a. Tensioned Screen Viewing Surface:
         1) Front projection, flame retardant, mildew-resistant vinyl.
         2) Gain 1.1
         3) Viewing Angle: 85-degree half angle
         4) Screen formation: 16:10
      b. Acceptable Materials
         1) HD Progressive 1.1

B. Type 2: PST-F 113'' Diagonal (60'' x 96'') Ceiling Recessed Projection Screen – Da-Lite Contour Electrol
   1. Screen Mounting: Ceiling Recessed
      a. Mounting Hardware: Included mounting hardware.
   2. Screen Size:
      a. Viewing area: 60'' H x 96" W
   3. Acceptable Screens:
      a. Tensioned Screen Viewing Surface:
         1) Front projection, flame retardant, mildew-resistant vinyl.
         2) Gain 1.1
         3) Viewing Angle: 85-degree half angle
         4) Screen formation: 16:10
      b. Acceptable Materials
         1) HD Progressive 1.1

C. Type 3: PST-F 123'' Diagonal (65'' x 104'') Ceiling Recessed Projection Screen – Da-Lite Contour Electrol
   1. Screen Mounting: Ceiling Recessed
      a. Mounting Hardware: Included mounting hardware.
   2. Screen Size:
      a. Viewing area: 65'' H x 104" W
   3. Acceptable Screens:
      a. Tensioned Screen Viewing Surface:
         1) Front projection, flame retardant, mildew-resistant vinyl.
         2) Gain 1.1
         3) Viewing Angle: 85-degree half angle
         4) Screen formation: 16:10
      b. Acceptable Materials
         1) HD Progressive 1.1

2.03 PRODUCT SUBSTITUTIONS

A. No substitutions

2.04 SCREEN MATERIALS

A. Non-drying, stabilized additives shall be added to the vinyl to maintain flexibility and provide functionality over a minimum temperature range of 40 to 100 degrees Fahrenheit, including heat stabilizers and non-phthalate plasticizers. Phthalate type plasticizers are not acceptable due to the possibility of negative health impact.

B. Fire retardants shall be added to the base materials to reduce smoke and flame spread. The screen shall have all appropriate labels and documentation as listed in those sections. Without

exception, screens which do not meet these requirements are not acceptable and will not be approved as equivalent.

C. Unless specified as a perforated screen, the screen shall be at least 97% opaque to maintain maximum contrast ratio. Projected light from the front shall not pass through the screen to be reflected back to the front of the screen. Ambient light from behind the screen shall not pass to the front of the screen. Non-perforated screens which are translucent are not acceptable.

D. The screen shall be seamless. Seams will cause deformation of the screen while rolled up and are therefore not acceptable. Seams in the viewable are visible to the audience and are not acceptable. Seams in the leader of rolled up screens will telegraph an impression into subsequent wraps of material which are viewable and therefore not acceptable.

2.05 PROJECTION SCREEN SIZES

A. Projection screen image sizes are shown on the drawing elevations and on a schedule included on drawing TA002. For each screen, provide the specified sized screen fabric with black drop above the viewing area, black side masks, bottom mask, tensioning devices, and batten to meet the intent of the specifications.

2.06 OPTICAL PERFORMANCE

A. For each type of screen shown in the drawings and listed in the project specifications the optical performance shall meet or exceed the values specified.

B. The screen material shall be a flexible front projection screen surface formulated for high output broadcast quality projection systems. The material shall be able to produce images with the strictest color fidelity and white field uniformity standards.

PART 3 EXECUTION

3.01 INSTALLERS

A. Provide experienced and qualified technicians to install electrically operated large venue projection screens.

3.02 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s written data, including product technical bullets, product catalog installation instructions, product carton installation instructions and Da-Lite Screen Company, Inc. technical data sheets.

3.03 EXAMINATION

A. Site verification of conditions:
   1. Verify that conditions of substrates previously installed under other sections of contracts are acceptable with electrically operated large venue projection screen installation.
   2. Ensure secondary support framing for screen has been installed in accordance with Section 05 12 00 – Structural Steel Framing.
   3. Inform Architect/General Contractor of unacceptable conditions immediately upon discover.
   4. Proceed with installation only after unacceptable conditions have been corrected.

B. Examine wall, ceiling, and conditions under which this works is to be performed. Notify the Contractor in writing of conditions detrimental to proper completion of the work. Beginning work means that the installer accepts substrates and conditions.

3.04 COORDINATION

A. Coordinate provision of wall screens with locations of other wall and ceiling mounted components such as visual display boards, casework, structural framing, light fixtures, air diffusers, ducts, and fire sprinklers to eliminate potential conflicts.

B. Coordinate requirements for blocking, construction of recesses, and auxiliary structural supports to ensure adequate means for installation of screens.

C. Coordinate installation of recessed mounted screens with construction of suspended ceilings or gypsum board ceilings

3.05 INSTALLATION

A. Arrange for timely delivery of the screen from the manufacturer. Do not store the screen for extended periods prior to installation. Coordinate pathway access to bring the screen into the building as required.

B. Install screens in accordance with the approved shop drawings. Strictly comply with the manufacturer's instructions and recommendations. Comply with all requirements as specified in this Section. Comply with all referenced standards.

C. Install projection screens at locations and heights indicated on drawings. Verify locations in field with Architect.

D. Provide and install blocking in all walls as required. Provide and install appropriate structural support in ceilings as required. Work ceiling tiles around openings for flush ceiling screens.

E. Accurately plumb, level, align, square and brace screens.

3.06 INSTALLATION

A. After installation of hardware, make adjustments and corrections to leave operating parts in perfect condition.

B. Touch-up damaged shop coatings and repair minor damage to eliminate all evidence of repair to the satisfaction of the owner’s representative.

C. Remove and replace work that cannot be satisfactorily repaired. Provide and install blocking in all walls as required. Provide and install appropriate structural support in ceilings as required. Work ceiling tiles around openings for flush ceiling screens.

3.07 TESTING AND PROTECTING

A. Protect projection screens from damage resulting from subsequent construction activities. Tape craft paper or other protective membrane over the screen housing opening until directed to remove them. If the protective materials interfere with the operation of the screen, remove power from the unit and document this action with clear and legible labeling.

B. Remove and replace damaged screens.

C. After the building is completely clean and prior to turning over the building to the owner for occupancy, deploy all rollup screens and allow them to hang for at least 72 hours to allow the screen fabric to relax into its natural flat and smooth shape. Remove any new debris and dust that have accumulated on the screen and exposed housing surfaces. After the 72-hour period, return the screens to the rolled-up position.

END OF SECTION

SECTION 11 53 00 - LABORATORY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laboratory equipment to be furnished by the Contractor and installed by the Contractor.

1.02 DEFINITIONS

A. Equipment responsibilities.
   1. CFCI: Contractor Furnished, Contractor Installed.

B. Rough-In-Point: Individual or common supply of mechanical, electrical, plumbing, fire protection, telecommunications and security through wall, floor, or ceiling, generally located within the equipment chase.

1.03 REFERENCES

A. American Society of Mechanical Engineers (ASME).
   1. ASME Code, Section VIII, Division 1 for Unfired Pressure Vessels.
   2. ASME Code, Section IX for Boiler and Pressure Vessels.

B. American Society of Testing and Materials (ASTM)
   1. ASTM C666/C666M

1.04 SUBMITTALS

A. Submit product data and shop drawings for each piece of tagged equipment as a single, complete, coordinated package. Partial submittals are not acceptable unless specifically approved by the Architect.

B. Product Data:
   1. Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads.
      a. Autoclaves: Include products purchased from outside manufacturers. Provide a list of components and their respective sources.
   2. Manufacturer's Installation Instructions: Indicate special installation requirements.
   3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required.
   1. Autoclaves: include the following:
      a. Routing of piping, physical devices and components to permit evaluation of accessibility.
      b. Safety valve design: Calculate safety valve size based on downstream pipe routing and backpressure. Coordinate with downstream piping layout shop drawings specified in Division 22.
      c. Include water purification equipment EQ-C.
   2. Modular Wall System: Indicate plans, elevations, assembly details, profiles, sizes, reinforcing, equipment openings, access doors, and components.

D. Test Reports: For source quality and field quality control testing of autoclave and glasswasher.

E. Closeout Submittals:
   1. Operation Data: Include description of equipment operation and required adjusting and testing.
   2. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and spare part sources.
   3. Instructional materials as specfied in PART 3 "Demonstration and Training."
   4. Extra Material Transmittal.
      a. For autoclave and glasswasher.
   5. Demonstration and Training Video: for autoclave and glasswasher.

6. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. Warrant that equipment is free of defective materials, design and workmanship

B. Warrant that equipment and material conforms to this Specification and agrees to make changes, adjustments, or replacements required to meet the Specifications at no cost to Owner.

C. Warranty Period: One year unless noted otherwise under individual equipment.

D. Warranties commence on the date of Final Acceptance.

PART 2 PRODUCTS

2.01 EQ-A - STERILIZER 26" X 26" X 39" (MEDIUM)

A. Manufacturers: Provide products from one of the following manufacturers.
1. Belimed Inc.; Miami, FL. 305-2523338. 305-252-3338. www.belimedusa.com.
2. BMT USA; Monroe, WA. 360-863-2252. www.bmtus.com.
3. Getinge USA, Inc.; Rochester, NY. 800-475-9040. www.getingeproducts.com.
4. Primus Sterilizer Company, Inc.; Omaha, NE. 402-344-4200. www.spire-is.com.
5. Steelco; West Palm Beach, FL. 561-791-8313. www.steelcospa.com.
6. Steris Corporation, Mentor. OH. 800-548-4873. www.steris.com.
7. Tuttnauer USA Co. Ltd.; Hauppauge, NY. 800-624-5836. www.tuttnauer.com.

B. Basis-of-Design Model: Subject to compliance with requirements, provide Steris Amsco 430LS autoclave. Comparable products may be provided by manufacturers listed above.

C. Features: Unit includes but is not limited to the following features.
1. Nominal internal chamber dimensions: 26"W x 26"H x 39"D.
2. Nominal chamber volume: 15.25 cu ft.
3. Door configuration: Double door, vertical-sliding.
4. Mounting: Recessed 1-Wall.
5. Service Side: Left side at loading end.
6. Operational Type: Pre-vacuum.
7. Stainless Steel chamber and doors construction.
8. Steam System: Clean Steam Integral Electric Stainless Steel Steam Generator.
   a. Integral steam generator will produce "Clean Steam" using ASTM D1193 Type 2 purified water.
9. Selectable processing cycles: Gravity, Liquid and Testing Cycle.
10. Control System: Microprocessor control system.
    a. Monitor, control and document all critical process parameters.
    b. Include an operator interface, printer, and main controller.
11. Drain cooling system: Drain discharge shall be indirectly cooled down to reduce the effluent temperature to 140 degrees F (60 degrees Celsius) or less.
12. Contamination Barrier: Air-Differential Seal
    a. Air-Differential Seal
       1) Prevent loss of controlled room air into sterilizer’s mechanical equipment areas.
       2) Air differential seals may be constructed from stainless steel sheet metal.
       3) Seal shall be attached to sterilizer (at area between the door and the mechanical equipment area) and to adjacent walls.

D. Accessories:
1. Two Loading Carts and Two Transfer Carriages per sterilizer.

E. Utilities: Available utilities for equipment connection.

1. Steam: 40-80 psig.
    a. No building steam available, provide integral steam generator on each unit.
2. Purified water: Local RO Water system's reservoir tank.
    a. Purified water is fed at ambient temperature to steam generator.
3. Electrical for control panel: 120V, 60Hz, 1Ph.
4. Electrical for vacuum pump: 208V, 60Hz, 3Ph.
5. Electrical for steam generator: 480V, 60Hz, 3Ph.
6. Air: 75-95 psig.
7. Hot Water: 50 psig, temperature equal or less than 140 deg. F.
    a. Provide for a back-up hot water feed in the event pure water is unavailable.
8. Cold Water: 50 psig.
9. Drain: 12 inch by 12 inch floor sink with 3 inch drain.

F. Maintenance Service during warranty period:
1. Provided by Manufacturer’s field service technician or Manufacturer’s trained and authorized field service representative.
2. Includes emergency repair and preventative maintenance service.
3. Includes emergency parts replacement.
4. Emergency Service:
    a. Repair and replacement defective parts.
    b. Guaranteed 4 hour verbal response during normal working hours.
    c. Guaranteed 48 hours on site response.
5. Preventative Maintenance:
    a. Periodic maintenance of components and adjustment of operation.
    b. Includes not less than 4 visits by field service personnel.
6. Provide parts and supplies as used in the manufacture and installation of original equipment.
7. Spare parts: Available for on site replacement within 48 hours.

2.02 EQ-B - MODULAR WALL.

A. Responsibility: CFCI.

B. Manufacturers: Same as sterilizer manufacturer above.

C. Features: Unit includes is but not limited to the following features.
1. Install at face of sterilizer.
2. Stainless Steel finish with # 4 finish.
3. Powder coat painted steel concealed components.
4. Include hardware for connecting panels.
5. Modular components ready for assembly and connection to finished building or wall and ceiling.
6. Panel Design:
    a. Vertical Panels: Design each with pre-drilled holes in each side of flange panels for bolting to each other.
    b. Support Column: Corner-welded, tubular, carbon steel. Weld ceiling plates to column and channel clips on back side of vertical panel.
    c. Horizontals panels: Pre-drill holes in each side to facilitate bolting to adjacent panels.
    d. Door: Double-pan construction. Use single sheet of material for each panels. Fit door with hinges and spring lock. Design lock to open from outside of the wall enclosure by key, and from inside by manual lock release. Furnish two keys.
    e. Other Construction: Form each wall panel from single sheet of metal. Box-shape each panel; bond 0.050-inch thick, flame-retardant, sound-deadening board to back side.

2.03 EQ-C - GLASSWARE WASHER/DRYER

A. Responsibility: CFCI.

B. Manufacturers: Provide products from one of the following manufacturers.

1. Lancer USA Inc., Winter Springs, FL, 800-332-1855. www.lancer.com.
2. Miele Inc., Princeton, NJ, 800-843-7231. www.miele.com.
3. Steelco; West Palm Beach, FL. 561-791-8313. www.steelcospa.com.
4. Steris Corporation. Mentor, OH. 800-548-4873. www.steris.com.

C. Model:
1. Basis-of-Design unit: Subject to compliance with requirements, provide Labconco: SteamScrubber Undercounter Laboratory Glassware Washer.
2. Comparable units may be provided by the manufacturers listed above.

D. Features: Unit includes but is not limited to following features.
1. Nominal internal chamber dimensions: 32"H x 24"W x 28"D.
2. Nominal chamber volume: 10 Cu Ft.
3. Mounting Configuration: 1 door undercounter cabinet housing.
4. Provide viewing window.
5. Chamber Construction: Type 304 or 316 stainless steel.
6. Door: One of the following construction and operation type:
   a. Front hinged.
7. Selectable automatic wash programs.
8. Water Heater: Electric heated.
9. Drying System: Forced hot air system.
10. Drain discharge cool-down system, to reduce the temperature of effluent below 140 degrees F prior to discharge.
11. Accessories:
    a. For each chamber, provide the following manufacturer rack systems:
       1) Standard racks, bulk tube insert, utensil basket with cover and standard inserts.
          (a) For Basis-of-Design unit, provide Part 4577100 Labconco SteamScrubber Starter Kit.
       2) Upper and Lower spindle racks:
          (a) For Basis-of-Design unit, provide Parts 466860 and 4668900 Labconco SteamScrubber Upper and Lower Spindle Racks.
       3) Glassware Holders: for 4-inch and 6-inch glassware.
          (a) For Basis-of-Design unit, provide Parts 4424600 and 4424800 Labconco SteamScrubber vinyl coated type 304 stainless steel holders with height adjustment screw.
          (b) Quantity: Provide ten (10) of each size per glassware washer, in protective packaging.
       4) Powder Wash and Neutralizing Acid Rinse:
          (a) Powder Wash: For Basis-of-Design unit, provide 4422000 Labconco LabSolutions Non-foaming powder detergent 10 lbs pail.
          (b) Neutralizing Rinse: For Basis-of-Design unit, provide 4522200 Labconco LabSolutions Neutralizing Acid Rinse. Provide two bottles.
       5) Neutralizing Acid Rinse Dispensing Kit, including pump, float switch, tubing and plastic container.
          (a) For Basis-of-Design unit, provide Part 4595120 Labconco SteamScrubber Starter Kit, consisting of
12. Utilities: The following utilities will be available for equipment connection.
    a. Electrical: 208V, 60Hz, 1Ph.
    b. Hot water: 50 psig.
    c. Cold water: 50 psig.
    d. Purified water for final rinse: Local RO water system's reservoir tank, see EQ-D.
       1) Flow rate for Basis-of-Design unit: minimum 0.9 gallons per minute.
    e. Drain: as indicated in drawings.

E. Maintenance Service during warranty period:
1. Provided by Manufacturer’s field service technician or Manufacturer’s trained and authorized field service representative.

2. Includes emergency repair and preventative maintenance service.
3. Includes emergency parts replacement.
4. Emergency Service:
   a. Repair and replacement defective parts.
   b. Guaranteed 4 hour verbal response during normal working hours.
   c. Guaranteed 48 hours on site response.
5. Preventative Maintenance:
   a. Periodic maintenance of components and adjustment of operation.
   b. Includes not less than 4 visits by field service personnel.
6. Provide parts and supplies as used in the manufacture and installation of original equipment.
7. Spare parts: Available for on site replacement within 48 hours.

2.04 EQ-D - RODI WATER PURIFICATION UNIT FOR GLASSWARE WASHER AND STERILIZER.

A. Responsibility: CFCI.

B. Manufacturers:
1. Barnstead/ThermoFisher, Waltham, MA. 781-622-1000. www.thermofisher.com.
2. Elga, LLC., Woodridge, IL. 887-315-3542. www.elgalabwater.com.
3. Millipore Corp., Bedford, MA. 800-645-5476. www.millipore.com.
4. US Filter, Lowell, MA. 800-466-7873. www.usfilter.com.

C. Basis of Design:
1. Subject to compliance with requirements, provide Millipore: Milli-Q HX 7000 Central Water Purification System. Comparable products may be provided by Manufacturers noted above.

D. Features: Unit includes but is not limited to the following:
1. Produces ASTM D1193 Type II water from tap water feed.
2. Resistivity: Minimum 90 percent inorganic.
3. Production capacity: Produces minimum 150 L/hr at 15 degrees C.
4. Delivers pressurized water continuously.
5. Provide integral pump to feed sterilizer EQ-A and glassware washer EQ-C. Size pump to supply pure water at volume and rate required by sterilizer and glassware washer.
6. External Reservoir:
   a. Basis of Design: Millipore SDS 200L Storage and Distribution System.
   b. Flow rate: 20L/min. minimum. Pressure range 30-87 psi.
7. Unit shall have recirculation feature to maintain optimum water quality.
8. Provide unit with accessories including cartridges, filters and storage tank, for the unit to produce and distribute ASTM D1193 Type II water.
   a. Provide fresh filters, cartridges and membranes.
   b. Furnish one set of spare filters, membranes and cartridge refills.
9. Provide 3/4 inch polypropylene piping loop from RO unit with 4 drops to EQ-A and EQ-C.

E. Utilities: The following utilities will be available for equipment connection.
1. Electrical: 120V, 60Hz, 1Ph.
2. Cold water: 50 psig.
3. Drain: Floor sink with 3 inch drain.

2.05 EQ-E - ICE MACHINE.

A. Responsibility: CFCI.

B. Manufacturers: Provide products from one of the following manufacturers.
1. Hozhizaki America; Peachtree City, GA. 800-438-6087. www.hoshizakiamerica.com.
2. Ice-O-Matic, Denver, CO. 800-423-3367. www.iceomatic.com
3. Manitowoc Ice, Inc., Manitowoc, WI. 800-545-5720. www.manitowocice.com.
4. Scotsman Ice Systems, Vernon Hills, IL. 800-726-8762. www.scotsman-ice.com.

C. Basis-of-Design Model:

1. Subject to compliance with requirements, provide Hoshizaki: F-330BAJ Flake ice maker. Comparable products may be provided by Manufacturers listed above.

D. Features: Unit shall includes but not limited to the following features.
1. Provides flake ice.
2. Production capacity: 243 lbs per 24 hours at 90 degrees F air temperature, and 70 degrees F water temperature.
3. Condenser type: Air-cooled.
4. Storage bin capacity: 80 lbs of ice per ARI standard.
5. Unit shall be UL, CUL, NSF and USDA listed.
6. Exterior finish: Manufacturer standard with stainless legs.
7. Refrigerant for Basis-of-Design Product: R-404A.

E. Utilities: The following utilities will be available for equipment connection.
1. Electrical: 120, 60Hz, 1-ph.
2. Cold water: 30-80 psig.
3. Drain: 2 inch floor drain.

2.06 EQ-F - PURIFIED WATER STORAGE AND DISPENSER

A. Responsibility: CFCI.

B. Description: A water purification, storage and dispensing system capable of receiving tap water, polishing water using reverse osmosis and de-ionization technology, storing and dispensing ASTM D1193, Type 1 (ultrapure) water at specified flow rates.

C. Manufacturers:
1. Barnstead/ThermoFisher, Waltham, MA. 781-622-1000. www.thermofisher.com.
2. Elga, LLC., Woodridge, IL. 887-315-3542. www.elgalabwater.com.
3. Millipore Corp., Bedford, MA. 800-645-5476. www.millipore.com.
4. US Filter, Lowell, MA. 800-466-7873. www.usfilter.com.

D. Basis of Design:
1. Subject to compliance with requirements, provide Merck Millipore; Milli-Q EQ 7016 Ultrapure Water Purification System. Comparable products may be provided by Manufacturers noted above.

E. Features: Unit includes but is not limited to the following:
1. Produces Type I water from tap water feed.
2. Resistivity: 18.2 MOhm/cm.
3. Total Organic Carbon: Less than 5 parts per billion.
4. Particle size: No greater than 0.22 micrometers.
5. Production Flow rate: Up to 16 liters per hour.
6. Delivers pressurized water continuously.
7. Dispenser: Manufacturer's standard.
   a. Basis-of-Design: Subject to compliance with requirements, provide Merck Millipore; Q-Pod dispenser.
   b. Dispenser: capable of being fixed to purficiation unit or placed remote from purification unit. Provide stand for dispenser.
   c. Final water polishing may be provided at the dispenser.
8. EQ-Fa - External Reservoir:
   a. Basis of Design: Millipore 25L undercounter tank.
   b. Tubing: Manufacturer's standard flexible tubing suitable for delivering ASTM D1193 Type 1 water from reservoir to dispenser.
9. Provide unit with accessories including cartridges, filters, membranes, and storage tank, for the unit to operate as required above.
   a. Furnish one set of spare cartridges, filters, membranes.

F. Utilities: The following utilities will be available for equipment connection.
1. Electrical: 120V, 60Hz, 1Ph.
2. Water: from wall outlet specified in Div. 22 Plumbing sections..

2.07 EQ-G - STAINLESS STEEL PASS-THROUGH CHAMBER

A. Manufacturers:
   1. Clean Air Products, Inc.
   2. Cleanpro Cleanroom Products, Inc.
   3. Halco Products Co.
   4. Terra Universal, Inc.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Terra Universal; CleanSeam Pass-through chamber model 2636-04D. Comparable products may be provided by the manufacturers listed above.

C. Size: 18-inches wide by 18-inches deep by 24-inches high inside dimensions.

D. Material: AISI Type 304 stainless steel.

E. Construction:
   1. Chamber: continuously-welded without crevices.
   2. Doors: Leak-tested.

F. Glazing: Static-dissipative clear PVC glazing.

G. Gasketing: Manufacturer's standard non-outgassing rubber or silicone gasket.
   1. Mechanically attach gasketing to frame.

H. Hardware:
   1. General: stainless steel material, including bolts.
   2. Latches: manufacturer's standard stainless steel lifting latch.
   3. Interlocks: to prevent one door from opening unless the other door is closed.
   4. Hinges: Manufacturer's standard butted hinge.

2.08 SOURCE QUALITY CONTROL

A. Autoclaves: Perform Biological Challenge Testing required by AAMI ST79 "Steam Sterilization for Healthcare Facilities."

PART 3 EXECUTION

3.01 EXAMINATION

A. General: Examine surfaces designated to receive work for conditions, which would adversely affect the finished work. Repair or replace surfaces not meeting tolerances or quality requirement governing substrate construction prior to start of work.

B. Utilities: Inspect and verify that necessary utilities have been roughed in prior to equipment installation.

3.02 PREPARATION

A. Provide rough-in frame and anchors for placement by other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions. Secure fixed equipment to building structure.

B. Connect services and utilities to laboratory equipment, including intakes and drains.

C. Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

3.04 FIELD QUALITY CONTROL

A. Autoclaves: Perform Biological Challenge Testing required by AAMI ST79 "Steam Sterilization for Healthcare Facilities."

3.05 START-UP

A. Autoclaves: Prior to commencing Demonstration and Training, start system to verify proper operation and services. Test and adjust equipment.

3.06 DEMONSTRATION AND TRAINING

A. Demonstrate equipment operations and functions to representatives designated by the Owner at completion of installation.
   1. Autoclaves: Provide minimum four hours training session.
   2. Glassware washers: Provide minimum two hours training session.

B. Conduct on-site demonstration and training seminar, including providing instructional materials for use, cleaning, and maintenance.
   1. Location and time with Owner.
   2. Instructional materials shall include, but not be limited to, minimum 10 copies each:
      a. Equipment Manufacturers Owner Manual.
      b. Equipment Manufacturers Maintenance Manual.
      c. Equipment schematic and parts manual.

C. Video record demonstration and provide Owner/Designer copy as a Closeout Submittal.
   1. Final recording format and media storage to be confirmed with Owner prior to training seminar.

END OF SECTION

SECTION 11 53 13 - LABORATORY FUME HOODS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Bench mounted laboratory fume hoods.
      a. ADA compliant.
   2. Fume hood work surface.
   3. Fume hood base cabinets.
   4. Laboratory gas and electrical service fittings and fixtures in fume hoods.
   5. Fume hood alarm system.
   6. Accessories and safety signage.
   7. Fume hood commissioning.

1.02 RELATED REQUIREMENTS

A. Section 11 53 14 - Polypropylene Laboratory Fume Hoods.

B. Section 12 35 53 - LABORATORY CASEWORK.

C. Division 23 - Mechanical

1.03 REFERENCES

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

F. NFPA 30 - Flammable and Combustible Liquids Code; 2021, with Amendment (2020).

G. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2019.

H. SEFA 1 - Laboratory Fume Hoods; 2010.

I. SEFA 8M - Laboratory Grade Metal Casework; 2016.

1.04 DEFINITIONS

A. Broom Clean: A condition in an interior area in which surface debris has been removed by dry methods.

B. Rough-In Point: Individual or common supply of mechanical, electrical, and heating, ventilating and air conditioning (HVAC) through wall, floor, or ceiling, generally located within the utility umbilical, equipment chase, or service space behind cabinets.

C. Related Equipment. Items not generally manufactured by fume hood manufacturer but furnished and installed as part of fume hood work.

1.05 PERFORMANCE REQUIREMENTS

A. Casework components shall withstand the following minimum loads without damage to the component or to the casework operation when tested in accordance with SEFA 8M, SEFA 8P, SEFA 8PL, SEFA 8W.
   1. Steel base unit load capacity:
      a. 200 lb (91 kg) per square foot of cabinet top area.
      b. Leveling bolts: 500 lb (227 kg) each; minimum one per corner of each base cabinet.

2. Drawers in a cabinet: 150 lb (68 kg) uniform load with smooth operation for minimum 10,000 cycles of opening and closing.
3. Shelves: Shelves of base units, 100 lb.

1.06 SUBMITTALS

A. Submit all of the following on the same date. Submit complete, coordinated data. Partial submittals are not acceptable unless specifically approved by the Architect.
1. Product data.
2. Certificates.
3. Samples.
4. Shop drawings.
5. All of the above for this section and for Section 12 35 53 - LABORATORY CASEWORK.

B. Product Data: Manufacturer's catalog data, specification sheets, and product manuals.

C. Certificates:
1. Certify compliance with ASHRAE Std 110.
2. Certify that fume hoods meet the performance requirements specified herein.

D. Samples: Samples will be reviewed for color, texture, and pattern only.
1. Hood enclosure: 6 inch (152 mm) x 6 inch (152 mm), two samples of each color specified.
2. Front panel: 6 inch (152 mm) x 6 inch (152 mm), two samples of each color specified.
3. Liner: 6 inch (152 mm) x 6 inch (152 mm), two samples of each material and color specified.
4. Operation signage: One actual size sample of each sign.

E. Shop Drawings:
1. Submit shop drawings for fume hoods showing the following:
a. Plans, elevations, ends, cross-sections, service run spaces, location and type of service fixtures with lines thereto.
b. Details and location of anchorages and fitting to floors, walls, and base.
c. Layout of units with relation to surrounding walls, doors, windows, lighting and air conditioning fixtures, and building components.
d. Connection to hood exhaust system; location of access doors, cutoff valves, and junction boxes.
e. Coordinate shop drawings with other work involved.
f. Indicate in-wall blocking and rough-in requirements for coordination with other trades.
2. Provide rough-in drawings for mechanical and electrical services.
3. Provide face opening, air volume, and static pressure drop.

F. Closeout Submittals:
1. Operation Data: Submit two copies of operating and maintenance instructions for each fume hood, provided in booklet form providing information on adjustment, operation, and maintenance of hoods.
2. Warranties.

1.07 MAINTENANCE MATERIALS

A. Complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints and other materials necessary to performa permanent repairs to damaged fume hood finish.

1.08 QUALITY ASSURANCE

A. Fume Hood Standard: Provide fume hoods complying with the requirements of SEFA 1, "Laboratory Fume Hoods - Recommended Practices."

B. Provide factory testing of each type of fume hood specified to demonstrate fume hood performance. Provide testing facility, instruments, equipments, and materials needed for tests.

C. Maintain testing facility at manufacturer's place of business for testing and evaluating laboratory fume hoods under both ideal and adverse conditions, in accordance with ASHRAE Std 110.

D. Make manufacturing facility, testing facility, and quality control procedures available for Owner inspection.

E. Manufacturer Qualifications:
   1. Minimum five years of manufacturing fume hoods as a principal product.
   2. Ten installations of equal or larger size and requirements.

F. Installer Qualifications:
   1. Factory certified by manufacturer.
   2. Ten installations of equal or larger size and requirements.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver fume hoods, work surfaces, and accessories free of damage.

B. Ship fume hoods disassembled to fit easily through corridors and doorways at the site.

C. Store and handle in a manner to prevent damage to fume hoods, work surfaces, accessories, or adjacent work.

1.10 PROJECT CONDITIONS

A. Coordinate fume hood and service fitting installation with size, location and installation of service utilities.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Rooms in which fume hoods are to be installed shall be broom clean.

D. Coordinate with Laboratory Casework installation.

1.11 WARRANTY

A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of laboratory fume hoods during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the terms and conditions of the Contract Documents.

B. Warrant against defects in materials and workmanship on fume hoods, work surfaces, and accessories; include labor and replacement parts (except lamps).

C. Warranty Period: One year from date of Final Acceptance or two years from date of purchase, whichever is sooner.
   1. Provide a 5 year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Provide all laboratory fume hoods and accessories through one source from a single manufacturer.
   1. Obtain laboratory fume hoods through same source from the same manufacturer as laboratory casework specified in Section 12 35 53 - LABORATORY CASEWORK.
   2. Metal fume hood base cabinets to be provided by the selected laboratory fume hood manufacturer.

B. Acceptable Manufacturer includes:
   1. A.T. Villa; Milwaukee, WI, 800-554-9259: www.atvilla.com.
   2. Bedcolab Ltd. Laval, Quebec, Canada, 800-461-6414. www.bedcolab.com.
   3. Kewaunee Scientific Corporation, Statesville, NC, 704-873-7202. www.kewaunee.com.
   4. Mott Manufacturing Ltd, Brantford, Ontario, Canada, 519-752-2895. www.mott.ca.

2.02 PRODUCT OUTLINE

A. FH-1A-B - Polypropylene Fume Hood.

1. As specified in Section 11 53 14 "Polypropylene Laboratory Fume Hoods."

B. FH-2A-B - General Purpose Fume Hood.
   1. Physical Type: Bench Mounted.
      a. Provide accessible fume hood.
   2. Operational Features:
      a. Operational Type: Constant Volume with Open Bypass.
      b. Face Velocity: 100 ft per minute
   3. Sash:
      a. Sash Type: Vertical Rising, Frameless Sash.
      b. Sash Stop:
         1) Manual Type.
         2) Location: 18 inches
   4. Size:
      a. Width: See Fume Hood Schedule on Laboratory Drawings.
      b. Depth:
         1) Exterior: 33"-36".
         2) Interior Working: 24"-26".
   5. Exterior Material: Painted, 18 gauge cold rolled steel.
   6. Exterior Color: Match adjacent laboratory metal casework.
   7. Interior Liner: Polyresin.
   8. Work Surface: Cast Epoxy Resin.
   9. Base Cabinet: See Laboratory Drawings.
   10. Service Fixtures: See Fume Hood Schedule on Laboratory Drawings. Refer to Specification 123553 Laboratory Casework.
   11. Safety Monitor/Alarm System:
      a. Measure face velocity.
      b. Local visual and audible alarm.

C. Provide factory installed pipes and wires for plumbing and electrical services as indicated on Laboratory Drawings.
   1. Pre-piped Configuration: Piped to 6 inch above top of hood.
   2. Pre-piped material:
      a. Air: Copper.
      b. Natural Gas: Black Iron.
      c. Specialty Gas: Copper.

2.03 OPERATIONAL FEATURES

A. Open Bypass Fume Hood for Use with Constant Volume (CV) Exhaust System:
   1. Open Bypass Fume Hood shall incorporate an automatic air bypass feature above sash opening, which open as sash is closed, to limit the increase in face velocity.
   2. Face velocity at the sash shall not exceed 120 fpm.
   3. Face velocity, when measured at the sash opened 6 inches, shall be no more than 3 times the velocity at the sash fully open.

2.04 FABRICATION/MATERIAL-BENCH MOUNTED HOODS

A. Enclosure Construction:
   1. Exterior Shell Material: Cold-rolled sheet steel; ASTM A1008/A1008M, Designation CS; minimum 18 gauge.
   2. Fabricate fume hoods in double wall construction, prefinished, cold-rolled steel exterior shell, with an interior liner and baffle of chemical resistant material as noted.
   3. Framework: Frame shall be heavy gauge, welded steel members, reinforced, braced and assembled with exterior shell and interior liner to form a rigid, self-supporting enclosure unit.
   4. Screw together component parts to allow removal of interior liner, end panels, front end fascia pieces, top fascia and air foil strips, and to allow access to plumbing lines and service fixtures.

5. End Panels:
    a. Double wall construction; not more than 5 inches (102 mm) wide; without projecting corner posts or obstructions to interfere with smooth, even flow of air.
    b. The area between double walls shall house and conceal framing, attaching brackets, remote operating service fixture mechanisms, sash counterbalances and vent pipes, if necessary, from base cabinets.
    c. Access panel to service fixture mechanisms concealed between walls shall be provided by full overlap design, removable gasketed (70 durometer polyvinylchloride or equivalent) access panels on the inside liner walls, or through front corner covers.
    d. Terminate end panels flush with interior lining.
6. Corner Covers:
    a. Prepunched and plugged to accommodate up to four service fixtures and two electrical boxes on each side.
    b. 20 gauge material to match fume hood, prepunched and plugged to accommodate up to four service fixtures and two electrical boxes on each side.
    c. Mount corner covers vertically on each side of hood sash openings to access plumbing lines and valve connections from front of hoods.
7. Face Opening: Splay or radius top and of face opening to provide an aerodynamic airfoil section to ensure smooth, even flow into the hood.

B. Airfoil Vane:
1. Low profile, ergonomically designed to provide obstruction-free access to hood interior.
2. Mounted flush to top front edge of work surface.
3. Airfoil design shall assure a flow of air rearward along work surface at all hood operating face velocities.
4. On all bench mounted, provide a removable airfoil vane across bottom of face opening. Profile of airfoil shall match profile of side sections.
5. Mount airfoil with minimum 3/4 inch air space between the foil and top front edge of the work surface to direct positive flow of air across the work surface and to prevent backflow. Extend airfoil under sash line so that sash closes on top of foil.
6. Provide power cord/tube pass-through 3 inch square holes near each side post.
7. Material and finish: 14 gauge stainless steel; No. 4 satin finish.

C. Plenum Chamber:
1. Provide plenum with adequate volume for hood dimensions, extending full width of hood to equalize incoming air flow.

D. Bypass Grilles:
1. Provide bypass grilles to conceal plenum.
2. Bypass grilles shall be low resistance type, directionally louvered upward, or can function from above with non-directional grill in the Ceiling closure panel.

E. Interior Liners Material:
1. Polyresin:
    a. Material: Chemical and abrasion resistant, 1/4 inch thick, fiber reinforced thermoset composite material, defined as any of the following:
        1) White modified epoxy resin with fiberglass reinforced sheet.
        2) White polyester with fiberglass reinforced sheet.
        3) White press-molded, heat-converted catalyzed glass polyester sheet.
    b. Fabrication: Chemically welded seams.
2. Joints: Back-up joints with angles or cleats and coat joints with chemical resistant mastic before assembly to prevent open joints or spaces.

F. Baffles:
1. Same material as hood liner.
2. Multiple sections with continuous horizontal slot at the work surface.
3. Baffle position shall be factory-set for optimal airflow characteristic. Field adjustment shall not be required.

4. Each baffle panel shall be easily removable from the interior, without requiring liner disassembly.
5. Configuration: Full width, with adjustable openings at top and bottom to allow adjusted flow of air through hood to compensate for type of gas, apparatus, or heat source used. Baffles shall be removable for cleaning.
6. Adjustment:
    a. Stop: Provide stop at baffle openings to provide a minimum opening of 1 inch (25 mm).
    b. Flow restriction limits: The baffle design shall be such that it is impossible, by adjustment, to restrict the volume of air exhausted through the fume hood by more than 20 percent.
    c. Adjustment: Control airflow at top or bottom form a single point, with acid resistant plastic or stainless steel knobs mounted on within end panel enclosure and near front of fume hood.
    d. Baffle designs that require insertion of the operator's head or shoulders for adjustment are not acceptable.
7. Accessories:
    a. Fasteners:
        1) Enclosure panel assembly: Stainless steel truss head screws or rivets; not countersunk type.
        2) Hood baffle to cleats: Stainless steel screws.
    b. Removable plug buttons for holes not used for fixtures. Color to match fume hood.

G. Sash:
1. Vertical Rising Sash:
    a. Vertical rising 1/4 inch (5 mm) thick laminated safety float glass sash, epoxy-coated steel sash track, single counterbalance weight.
2. Glazing:
    a. Glass: Safety glass composed of two sheets of double-strength "B" quality, clear sheet glass permanently laminated with a sheet of clear plasticized polyvinyl butyral.
        1) Laminated with 0.015 inch (0.38 mm) thick clear, plasticized, polyvinyl butyral interlayer; comply with ASTM C1172.
        2) Comply with ASTM C1048, Condition A uncoated, Type 1, transparent, clear, flat, Class 1, q5 Glazing B Quality.
        3) Comply with ANSI Z97.1.
        4) 1/4 inch thick.
3. Sash Stops:
    a. Factory installed, cam style permanent sash stops.
    b. Location:
        1) 13 inches above the fume hood work surface at barrier free fume hoods.
4. Blank off panel: On bypass to reduce effective opening.
5. Signage: Provide label on fume hood at this point and a sign to read. "Operating conditions 100 fpm[100 fpm] - do not work in hood with sash bottom above this mark."
6. Alarm console: The alarm console shall produce an alarm signal if sash stops are overridden.
7. Provide notch at end of sash handle for pass through of cords.

H. Exhaust:
1. Entry Cones and Exhaust Connection: Hood manufacturer shall supply and install an acoustical duct transition from hood exhaust collar to the size required for building exhaust duct. Verify diameter dimension of exhaust duct size and location with mechanical drawings.
2. Transition to be equivalent material and finish to building exhaust duct and to conform to industrial ventilation standards. On fume hoods where two exhaust points exist, provide transition as required to accept two exhaust points to mate, as described above, with mechanical system.

I. Utility Service Fittings and Fixtures:
   1. Orient needle valves to the rear of fume hoods.
   2. Orient needle valves to be readily accessible without exposing operator's breathing zone to fume hood interior.
   3. Factory installed for services as indicated in Product Outline above.
   4. Operation: Remote control as specified in Section 12 35 53 - LABORATORY CASEWORK.
   5. Finish : As specified in Section 12 35 53 - LABORATORY CASEWORK.
   6. Fixtures Location:
      a. Plumbing service fixtures shall be located maximum 12 inch from the inside of the sash and shall be on a common vertical centerline.
      b. Barrier free fume hoods: Locate at the front of fume hoods.
   7. Hose Connectors for Conventional Bench Mounted Fume Hoods: Injection molded PVDF - Kynar®.
   8. Hood Service Fittings: 1/4 inch (6 mm) copper tubing, forged brass valves and seats, TFE-coated silicone bronze stem, TFE packing, and injection-molded PVDF 10-serration hose connectors.
      a. Fixture Handles: As specified in Section 12 35 53 - LABORATORY CASEWORK .
   9. Gas Valves: CSA International labeled with brass-lined copper service lines.

J. Lights:
   1. Type: LED light fixture of longest practicable length.
   2. Shield: 1/4 inch (6.4 mm) thick safety glass or 1/8 inch (3.2 mm) thick tempered glass panel, sealed air tight into hood body with chemical resistant rubber channels.
   3. Lamps: Furnished in accordance with requirements of the electrical Specifications.
   4. Include light switch, controls interface, and all internal wiring to circuit junction boxes located in upper right and/or left front of plenum area.
   5. Toggle Switch: Refer to the electrical Specifications for switch installation requirements. Location shall be on top left sash post.
      a. Barrier free fume hoods: Location shall be on bottom left sash post.
   6. Set units so that tubes are replaceable from outside hood.
   7. Provide only fixtures that carry UL label.
   8. Average interior illumination levels of the work area: 80-foot candles minimum.

K. Electrical Services:
   1. Type: Vapor proof.
   2. Electrical Outlets: Prewire fume hoods for a single point connection. Receptacles to be GFIC type.

L. Closure Strips: Metal to match adjoining surfaces. Provide to close openings between fume hood base cabinet and super-structure and adjacent building wall.

M. Service Port: Provide one port on right side of hood for passage of piping or cords to equipment and/or power furnished outside of hood.

N. Fasteners: Stainless steel where exposed to fumes in hood.

O. Signs:
   1. Type: Corrosion resistant plate.
   2. Location: Fume hood exterior.
   3. Content: Condensed information covering recommended locations for apparatus and accessories, baffle settings, and use of sash.

2.05 FINISHES

A. Exterior Sheet Steel Surfaces: Properly prepared and coated, electrostatically applied.
   1. Hood Exterior: Epoxy coating, dry powder.
   2. Hood Front Panel: Same color and finish with hood exterior shell.
   3. Color: To be selected from manufacturer's standard options.

B. Chemical and Physical Resistance of Finishes: Test finishes for resistance to chemical reagents in accordance with SEFA 8, and meets Level 1 rating - slight change in color or gloss, and with no loss of adhesion and no loss of film protection.
   1. Finishes to meet testing requirements:
      a. Exterior fume hood finish.
      b. Liners.
      c. Work surfaces.
      d. Storage cabinet finishes.
   2. Moisture Resistance: No visible effect when finish surface exposed to the following:
      a. Tested in accordance with SEFA 8.
      b. Constant Moisture using a 2 inch (51 mm) x 3 inch (76 mm) x 1 inch (25 mm) cellulose sponge, soaked with water, in contact with surface for 100 hours.
   3. Cold Crack: No effect when subjected to 10 cycles of temperature change from 20 degrees F (14 degrees C) for 60 minutes to 125 degrees F (52 degrees C) for 60 minutes.
   4. Adhesion and Flexibility:
      a. Adhesion: Tested in accordance with SEFA 8; ninety or more squares of the test sample shall remain coated after the scratch adhesion test.
      b. Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a 1/2 inch (13 mm) diameter mandrel.
   5. Hardness: Tested in accordance with SEFA 8 for surface hardness equivalent to 4H or 5H pencil.
   6. Abrasion resistance: Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrate #CS10 wheel.
   7. Humidity resistance: Withstand 1000 hour exposure in saturated humidity at 100 degrees F (38 degrees C).
   8. Salt spray: Withstand minimum 200 hour salt spray test.

2.06 WORK SURFACE

A. Cast Epoxy Resin Work Surface:
   1. Material: Cast epoxy resin.
   2. Thickness: 1 inch (25 mm).
   3. Color: Match color of laboratory casework work surface. Refer to Laboratory Casework specification.
   4. Fabrication:
      a. 3/8 inch (10 mm) deep dish rim to contain spills.
      b. Front edge: 6 inch (152 mm) wide by 1/2 inch (13 mm) thick raised edge.
      c. Edge at sides and rear: 1/2 inch (13 mm) wide by 1/2 inch (13 mm) thick raised edge.
      d. Edge attachment: Bond to working surface to make a watertight retaining pan.
   5. Epoxy Resin Cup Sink:
      a. 6 inch by 3 inch (150 by 75 mm) oval epoxy cupsink with 1-1/2 inch (38 mm) drain connection.
      b. Bench mounted fume hood: Mount flush with recessed top of work surface.
         1) Mount at the front of fume hood at Barrier Free Fume Hoods.
      c. Floor mounted fume hood: Side mounted.

2.07 FUME HOOD BASE CABINETS - METAL

A. Material
   1. Sheet Steel:
      a. Mild, cold rolled and leveled unfinished steel.
      b. Minimum gauges:
         1) 20 gauge: Interior door fronts, filler panels, shelves.
         2) 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, and uprights.
         3) 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails.
         4) 14 gauge: Door and case hinge reinforcements and front corner reinforcements.

2. Sound Deadening Material: Inorganic, for sandwich panel fabrication.

B. Fume Hood Base Cabinet:
1. Design: Match Metal Casework in 12 35 53 Laboratory Casework.
2. Color and Finish: Match fume hood.

C. Acid Storage Cabinets:
1. One piece corrosion resistant interior liner, including the backside of doors and shelf surfaces.
2. One-piece corrosion resistant insert tray with 2 inch lip for containment of spills at bottom of cabinet.
3. One shelf with 1 inch lip, adjustable on 1 inch increments.
4. Vented with a minimum 1-1/2 inch I.D. corrosion resistant vent pipe at rear of cabinet terminating inside of fume hood 2 inch above the working surface, color to match work surface.
5. Vent pipe shall be close to rear of hood as possible, located in the raised area of the worksurface. Seal opening between working surface and pipe with chemical resistant material.
6. Exhaust ports shall have fire screens.
7. Non-metal door catch or strike plate.
8. Front of cabinet labeled with minimum 1 inch high, 1/4 inch stroke red letters: "ACID".
9. Color and Finish: Match fume hood.
10. Design: Inset Steel.

D. Flammable Liquids Storage Cabinets:
1. Identified for flammable and combustible liquids shall be constructed in compliance with UL, OSHA, NFPA 30, and UFC Article 79.
2. Self closing and self latching doors synchronized so that both doors will always fully close.
3. Bottom of the cabinet liquid tight to a height of 2 inches.
4. Cabinet shall not have vent outlet.
5. Front of cabinet labeled with minimum 1 inch high, 1/4 inch stroke red letters: "FLAMMABLE - KEEP FIRE AWAY".
6. Color and Finish: Match fume hood.
7. Design: Inset Steel.

2.08 SASH ALARM

A. Audible and visual alarm that activates when sash is opened beyond present position.

B. Sash Alarm integrated with Airflow Alarm.

C. Furnished as specified in Division 23.

2.09 AIRFLOW SAFETY MONITOR/ALARM SYSTEM

A. Type:
1. Hot wire anemometer sensor.
2. Direct pressure measurement.
3. Atmospheric sensor.

B. Operation:
1. Measure and digitally display linear feet per minute of airflow.
2. Measure and record fume face velocity.
3. Signals unsafe operating conditions whenever fume hood exhaust volumes fall below or above a user determined level.
4. Signals unsafe operating conditions whenever fume hood exhaust volumes fall below 80% of that specified for the fume hood or as indicated. Set to activate alarm whenever face velocity deviates from the following:
   a. Sash in position for operating condition: Less than 80 ft/min (27.4 m/min); greater than 120 ft/min (29.5 m/min).
5. Remote alarm relay output capability.
6. Alarm delay capability.

7. Power requirements: 120 volt AC; prewired to the fume hood.

C. Components:
1. Alarms:
a. Digital Display: Liquid crystal display indicating current status.
b. Audible Alarm Indicator: Minimum intensity of 80 decibels at 4 inch.
c. Visual Alarm Indicator: Green LED light for normal condition, Red LED warning light for low flow and high flow.
d. Audible alarm and red warning light shall operate simultaneously to indicate an unsafe operating condition.
2. Silencer switch: When the silencer switch is activated, the red warning light shall remain “ON” until the unsafe condition is corrected and the alarm unit is manually reset.

D. System Adjustment: Adjust the fume hood alarm system after the building air handling system has been balanced.

E. Console Mounting: Mounted on the front of the fume hood as shown on drawings, facing front of hood.

F. Cut-out for Alarm Interface Panel: Provide factory, template to be provided by alarm system installer.

G. Notification Plate: Mount plate on the front of the fume hood housing, adjacent to safety alarm console. Notification shall read as follows:

Alarm will activate when unsafe exhaust condition exists.
Red lamp and audible alarm will activate.
SHUT DOWN EXPERIMENT AS RAPIDLY AS POSSIBLE.
Close sash.
Report condition to Safety Office personnel.

H. Signage:
1. Lettering: Manufacturer's standard lettering, background colors, and mounting.
2. Signage Messages: In accordance with requirements of NFPA 45.

2.10 FUME HOOD CONTROLLER

A. Furnished by fume hood manufacturer's standard controller.

2.11 ACCESSORIES

A. Ceiling Enclosures: Provide ceiling enclosure with removable access panel located on the lower portion of the front panel if access to change lamps is required.
1. Color and finish to match fume hood structure.
2. Ceiling enclosures shall extend 6 inch above suspended acoustical lay-in ceiling and shall fit flush against hard surface gypsum board ceiling.

B. Distillation Rack: Solid 1/2 inch aluminum rod lattice and hardware to support interior hood apparatus where indicated on Laboratory Drawings. Vertical and horizontal rods at 12 inch nominal spacing forming lattice.

C. Fume Hood Identification Plate: Provide corrosive resistant metal plate attached to the fume hood exterior with condensed information covering fume hood identification and initial performance label completed by the performance testing contractor.
1. Each fume hood that passes the performance tests shall be labeled with the following baseline information inscribed into the tag:

-Date tested
-Name of Inspector
-Company Inspecting
-Testing protocol used (such as ASHRAE Std 110 smoke visualization)
-Average face velocity noting the specified maximum operating sash height (measured from bench top to bottom of sash; for combination sashes, horizontal sashes are to be closed -during testing).
-Hood static pressure in inches of water.

-Hood exhaust volume.
-Type of exhaust system: VAV, CAV and Diversity if less than 100%.
-Fan identification tag number.
-Hood Tag number (PP#).
-Hood Location: Building name and Room Number.

2.12 SOURCE QUALITY CONTROL

A. Factory test one fume hood of each type manufactured according to approved shop drawing before shipment.

B. Factory Testing Requirements:
   1. Test Room: Set up test hood in a test room of sufficient size with a minimum of 5 feet clear space in front of the hood and on both sides of the hood for viewing the test.
   2. ASHRAE Std 110 - As Manufactured (AM) test shall includes.
      a. Exhaust Stability Test
      b. Local Visualization Challenge (Low -Volume Smoke Test).
      c. Large-Volume Visualization Challenge (High-Volume Smoke Test).
      d. Face Velocity Testing:
         1) 100 ft/min; with deviation of plus or minus 20 ft/min.
      e. Tracer Gas Containment Testing:
         1) Test to a control level of AM 0.05 ppm or better.

C. Static Pressure Loss for Bench Mounted Fume Hoods:
   1. Face velocity of 75 ft/min (0.38 m/s): Maximum 1/4 inch (6.4 mm) of water gauge.
   2. Face velocity of 100 ft/min (0.51 m/s): Maximum 1/2 inch (13 mm) of water gauge.
   3. Face velocity of 120 ft/min (0.62 m/s): Maximum 1/2 inch (13 mm) of water gauge.
   4. Constant volume fume hoods with bypass: Static pressure and exhaust volume shall be relatively constant regardless of sash position.

D. Face Velocity at Sash Opened 6 inch (152 mm): Maximum 3 times face velocity at sash fully opened.

E. Provide documentation showing the test result. Report of tests previously performed on the same design are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for fume hood installation.

B. Coordinate for proper installation of plumbing and electrical services.

3.02 PREPARATION

A. Repair, replace, and fix irregularities that will affect the quality of the execution of the work specified.

3.03 INSTALLATION

A. Install fume hoods, plumb, level, rigid, securely anchored to building and adjacent furniture in locations indicated.

B. Provide filler panels between top of hood and ceiling.

C. Provide enclosure panels as indicated.

D. Securely attach access panels but provide for easy removal and secure attachment.

E. Do not install any damaged units.

F. Affix one copy each of the following to an unobscured exterior side panel of each fume hood type on a per room basis prior to Final Acceptance.
   1. Fume Hood Manufacturers Owners Manual.

2. "Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards," National Research Council, Washington, DC.; National Academy Press, 2011: www.nap.edu.

3.04 INTERFACE WITH OTHER WORK

A. Coordinate with the schedule and other requirements of other work being performed in the area including, but not limited to, casework and work surface installation, mechanical and electrical connections to and in the fume hoods.

3.05 FIELD QUALITY CONTROL

A. Fume Hood Performance Testing Requirements:
   1. Test fume hoods after installation of fume hoods is complete, and the building ventilation and control system has been balanced, and utilities and services connections have been made.
   2. Test fume hood in accordance with SEFA 1 recommendations.
   3. Use ASHRAE Std 110-2016 Method of Testing Performance of Laboratory Fume Hoods to determine a benchmark performance.
   4. Owner reserves the right to require a modified version of ASHRAE Std 110 test or additional testing requirements.

B. Testing Responsibilities:
   1. ASHRAE Std 110, As Installed (AI) test: By Fume hood Manufacturer.
      a. Test all fume hood units installed in the Work of this Project.
      b. (AI) Test methods includes:
         1) Exhaust System Stability Test.
         2) Local Visualization Challenge (Low -Volume Smoke Test).
         3) Large-Volume Visualization Challenge (High-Volume Smoke Test).
         4) Face Velocity Measurements.
            (a) Face velocity grid test: 100 ft/min; with deviation of plus or minus 20 ft/min.

C. Correcting Deficiencies and Retest:
   1. If test results of testing specified above are not satisfactory, Fume hood manufacturer and Contractor shall take the following actions:
      a. Determine probable cause of deficiencies.
      b. Generate solutions for the problems determined in step "a" above.
      c. Implement a mitigation plan that include the solutions in step "b" above.
   2. Retest the fume hoods and compare the pre- and post-mitigation results to determine the effectiveness of the remedial work on the fume hoods.
   3. Repeat the effort until test result is accepted by Owner.
   4. Remedial work and retest shall not add cost and time delay to the Owner.

3.06 ADJUSTING AND CLEANING

A. Adjust operating equipment and moving parts, with the exception of air handling motors, for smooth and efficient operation for intended use.
   1. Sashes: Smooth, near-silent, and accurate operation with one hand and uniform contact of rubber bumpers. Ensure counterbalances operate without interference.
   2. Vertical-Rising Sashes: Operate smoothly without tilting when raised or lowered from either end; remain at rest in any open position.
   3. Baffles: Set with all openings adjusted to maximum open position.

B. Clean equipment, casework, work surfaces, light fixture lens, both sides of sash, and other surfaces as recommended by manufacturers, rendering work in new and unused appearance.

C. Clean adjacent construction and surfaces soiled in the course of installation of this work.

D. Touch up minor damaged surfaces caused by installation.

E. Replace damaged and defective components that cannot be repaired to new condition.

3.07 PROTECTION

A. Provide protective measures to prevent equipment and surfaces from exposure to other construction activity.

3.08 DEMONSTRATION AND TRAINING

A. Demonstrate fume hood operations and functions to representatives designated by the Owner at completion of installation.

B. Conduct on-site fume hood seminar, including providing instructional materials for use, cleaning, and maintenance.
   1. Location and time with Owner.
   2. Seminar shall be available to all employees designated by Owner.
   3. Instructional materials shall include, but not be limited to, minimum 10 copies each:
      a. Fume Hood Manufacturers Owners Manual.
      b. "Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards," National Research Council, Washington, DC.; National Academy Press, 2011: www.nap.edu.

END OF SECTION

SECTION 11 53 14 - POLYPROPYLENE LABORATORY FUME HOODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Bench mounted ADA-compliant polypropylene laboratory fume hoods.
   2. Electrical service fittings and fixtures in fume hood.
   3. Fume hood alarm system.
   4. Accessories.
   5. Fume hood commissioning.

1.02 RELATED REQUIREMENTS

A. Section 11 53 13 "Laboratory Fume Hoods."

B. Division 23 - Mechanical.

1.03 REFERENCES

A. ANSI Z9.5 - Laboratory Ventilation; 2022.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

C. SEFA 1 - Laboratory Fume Hoods; 2010.

D. SEFA 8P - Laboratory Grade Polypropylene Casework 2014.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2012.

F. NFPA 45 - Standard for Fire Protection for Laboratories Using Chemicals; 2011.

1.04 DEFINITIONS

A. Broom Clean: A condition in an interior area in which surface debris has been removed by dry methods.

B. Rough-In Point: Individual or common supply of mechanical, electrical, and heating, ventilating and air conditioning (HVAC) through wall, floor, or ceiling, generally located within the utility umbilical, equipment chase, or service space behind cabinets.

C. Related Equipment. Items not generally manufactured by fume hood manufacturer but furnished and installed as part of fume hood work.

1.05 SUBMITTALS

A. Submit all of the following on the same date. Submit complete, coordinated data. Partial submittals are not acceptable unless specifically approved by the Architect.
   1. Product data.
   2. Certificates.
   3. Samples.
   4. Shop drawings.

B. Product Data: Submit manufacturer's data and installation instructions for each type of fume hood.

C. Certificates
   1. Demonstrating compliance with ASHRAE Std 110.

D. Shop Drawings:
   1. Submit shop drawings indicating all materials and accessories. Include plans, elevations, sections, details, and attachments to other work. Show entire assembly including wiring, piping and ductwork service requirements.
   2. Indicate locations of blocking and other supports required for installing fume hoods.
   3. Indicate duct connections, electrical connections, and locations of access panels.
   4. Include roughing-in information for mechanical and electrical connections.

5. Show adjacent walls, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
6. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
7. In preparing shop drawings, verify that component parts and assembly of each item will support superimposed loads, without deflection detrimental to function, appearance and safety.

E. Samples for Verification: 6-inch- (150-mm-) square samples for each type of finish, including top material.
1. Minimum 6-inch by 6-inch samples.

F. Closeout submittals:
1. Operation Instruction: Submit 2 copies of operating and maintenance instructions for each fume hood, provided in booklet form providing information on adjustment, operation and maintenance of hood.
2. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of fume hoods with requirements based on comprehensive testing of hoods.
3. Warranties.

1.06 QUALITY ASSURANCE

A. Fume Hood Standard: Provide polypropylene fume hoods compliant with the requirements of SEFA 1 and ASHRAE Std 110.

B. Manufacturer's Qualifications:
1. Minimum five years experience manufacturing polypropylene fume hoods.
2. Ten installationis of equal or larger size and requirements.

C. Installer Qualifications:
1. Factory certified by manufacturer.
2. Ten installations of equal or larger size and requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver fume hoods, work surfaces, and accessories free of damage.

B. Ship fume hoods disassembled to fit easily through corridors and doorways at the site.

C. Store and handle in a manner to prevent damage to fume hoods, work surfaces, accessories, or adjacent work.

1.08 PROJECT CONDITIONS

A. Coordinate fume hood and service fitting installation with size, location and installation of service utilities.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Rooms in which fume hoods are to be installed shall be broom clean.

D. Coordinate with Laboratory Casework installation.

1.09 WARRANTY

A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of laboratory fume hoods during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the terms and conditions of the Contract Documents.

B. Warrant against defects in materials and workmanship on fume hoods, work surfaces, and accessories; include labor and replacement parts (except lamps).

C. Warranty Period: One year from date of Final Completion or two years from date of purchase, whichever is longer.

D. Provide a five year warranty to include coverage for the polycarbonate viewing screen and replacement of same.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers include:
1. NuAire, Inc.; Plymouth, MN, 763-553-1270: www.nuaire.com.
2. Air Control, Inc.; Henderson, NC, 252-492-2300: www.aircontrol-inc.com.
3. LM Air Technology, Inc.; Rahway, New Jersey, 252-492-2300: www.lmairtech.com.
4. TFI Inline Design Corp.; Commerce City, CO., 800-288-6823: www.tfiinlinedesign.net.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Design fume hoods so that, when connected to exhaust system that provides exhaust volume indicated on the drawings under normal laboratory conditions, fume hoods will operate in a safe, consistent, and efficient manner, within acceptable tolerances for face velocities specified. Dead air pockets and reverse air currents will not be permitted along surface of hood interiors. Negative interiors of face velocity shall not exceed 20 percent of the average face velocity.

B. Static Pressure Loss: Design fume hoods to minimize static pressure loss. With sash at full-open position, static pressure loss through the fume hood shall be no more than 0.38 inches of water gauge when the hood operates at a face velocity of 100 fpm. State the design static pressure loss in manufacturer's submittal. For all laboratory fume hoods equipped with a bypass, static pressure loss and exhaust volume shall be relatively constant regardless of sash position.

C. Containment: Provide fume hoods with the following performance ratings at a face velocity of 100 fpm (0.51 m/s) and a release rate of 4.0 L/min. when tested according to ASHRAE Std 110:
1. As-Manufactured Rating: AM 0.05 (0.05 ppm).
2. As-Installed Rating: AI 0.10 (0.10 ppm).

D. Chemical Resistance Requirements:
1. Acids: Not less than 10 drops (0.5 cc) applied to finish surface, covered with watch glass concave side down for 60 minutes, then washed and dried:

37 percent Hydrochloric Acid	75 percent Phosphoric Acid
85 percent Sulfuric Acid	98 percent Acetic Acid
25 percent Nitric Acid	

2. Solvent: Not less than 10 drops (0.5 cc) applied to finish surface, covered with watch glass concave side down for 60 minutes, then washed and dried:

Ethyl Alcohol	Benzene
Butyl Alcohol	Carbon Tetrachloride
Methyl Alcohol	37 percent Formaldehyde
Ethyl Acetate	Gasoline
Ethyl Ether	Naphtha
Methyl Ethyl	Kerosene
Ketone	Xylene
Toluene	Glycerin
Acetone	Furfural

3. Bases and Salts: Not less than 5 drops (0.25 cc) applied to finish surface, covered with watch glass convex side down for 60 minutes, then washed and dried:

25 percent Sodium Hydroxide	Saturated Sodium Chloride
28 percent Ammonium Hydroxide	Saturated Sodium Sulfide

40 percent Potassium Hydroxide Saturated Sodium Carbonate
Saturated Zinc Chloride

4. Moisture Resistance: No visible effect when finish surface exposed to the following:
   a. Hot water at a temperature of 190 degrees F (91 degrees C) to 205 degrees F (96 degrees C), trickled down surface at 45 degree angle for 5 minutes.
   b. Constant Moisture using a 2 inch by 3 inch by 1 inch cellulose sponge, soaked with water, in contact with surface for 100 hours.

2.03 PRODUCT OUTLINE

A. Product Designation: FH-1A-B.

B. Basis of Design, Model: Subject to compliance with requirements, provide NuAire FumeGuard NU-164, By-Pass Fume Hood. Comparable products may be provided by Manufacturers listed above.

C. Operational Features:
   1. Operational Type: Constant Volume with Open Bypass.
   2. Face Velocity: 100 ft per minute

D. Sash:
   1. Sash type: Vertical

E. Size:
   1. Depth: Minimum 31 inch.
   2. Width: See Fume Hood Schedule on Laboratory Drawings.

F. Material:
   1. Polypropylene.
   2. Color: White.

G. Work Surface Material:
   1. Material: Polypropylene.
   2. Depth: Minimum 24-inches.
   3. Color: White.

H. Base Cabinets: See Laboratory Casework drawings.

2.04 OPERATIONAL FEATURES

A. Open Bypass Fume Hood for Use with Constant Volume (CV) Exhaust System:
   1. Open Bypass Fume Hood shall incorporate an automatic air bypass feature above sash opening, which open as sash is closed, to limit the increase in face velocity.
   2. Face velocity at the sash shall not exceed 120 fpm.
   3. Face velocity, when measured at the sash opened 6 inches, shall be no more than 3 times the velocity at the sash fully open.

2.05 FABRICATION

A. Materials: Construct all components of stress relieved, fully seam-welded, reinforced white polypropylene. Construct the outer cabinet shell, inner workspace walls, spill trough plenum under work surface, work surface and base cabinet floor of 1/2-inch polypropylene. Construct the exhaust duct, access panels, rear baffle and front hood by-pass cover of 1/4-inch polypropylene. Fume hood shall be 100 percent metal free and use no nylon components.

B. Ends: Double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

C. Rear Baffles: Provide full width baffles at rear of hood with adjustable openings at top and bottom to allow adjusted flow of air through hood to compensate for type of gas, apparatus, or heat source used. Fabricate baffles of same material as hood lining. Baffles to be removable for cleaning. Provide one baffle at the top of the fume hood chamber and one immediately above the countertop. Provide baffle openings with a stop to provide a minimum opening of

1-inch. Design the baffle such that it is impossible, by adjustment, to restrict the volume of air exhausted through the fume hood by more than 15 percent. Provide control adjustment strips at top and bottom. Baffle designs that require insertion of the operator's head or shoulders for adjustment are not acceptable.

D. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining.

E. Bypass Grilles: Provide bypass grilles to conceal plenum, with required free opening.

F. Sash: Provide a vertical sliding sash with 1/4-inch Lexan Margard view screen set into polypropylene glide channels. Apply a “hardcoat” to the Lexan to increase abrasive and chemical resistance.

G. Sash Stops: Manufacturer's standard, factory-installed sash stops.
   1. Location: 13 inches above the fume hood work surface at barrier free fume hoods.

H. Sash frame: Counterbalance vertical sliding sash with sash weight and cable system. Design sash weights and cable mechanism to preclude and prevent the counterbalance system from coming untracked, due to rapid raising of the sash. Sash shall hold at any height without creeping up or down.

I. Lights: Provide sealed, rapid-start, fluorescent light fixture, of longest practicable length, complete with tubes. Build light fixture and ballast into a gasketed polypropylene hinged cover to provide access for maintenance. Protect all electrical wiring by U.L. listed flexible PVC conduit. Use PVC liquid-tight connectors to minimize direct exposure to fume laden interior air. Provide lamps for fixtures.
   1. Light levels at worksurface: 100 foot-candles (1076 Lux).
   2. Subject to compliance with requirements, light fixtures may be LED.

J. Sash Limits: Provide a sash with a work access opening from fully closed to 18-inches fully open. Provide keyed sash stop set to limit sash height when air quantity shown on HVAC drawings is drawn through sash at 100 fpm. Provide blank off panel on bypass to reduce effective opening.
   1. Signage: Provide label on fume hood at sash stop point and a sign to read. "Operating conditions 80 fpm - do not work in hood with sash bottom above this mark."

K. Filler Strips: As applicable to match adjoining surfaces. Provide as necessary to close openings between fume hood base cabinet or hood exterior and adjacent building construction.

L. Signs: Provide a corrosion-resistant plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings, and use of sash.

M. Work surface: Integral work surface with a leak tight seal. Provide additional 1/4-inch polypropylene reinforced sub layer when epoxy or phenolic resin work surfaces are used.

N. All internal electrical wiring shall be enclosed in liquid tight conduit. All internal junction boxes shall be liquid tight polypropylene. Electrical outlets shall have non-metallic, vapor tight gasketed covers.

2.06 SASH ALARM

A. Audible and visual alarm that activates when sash is opened beyond pre-set position.

B. Integrate sash alarm with Airflow Alarm.

2.07 SAFETY ALARM CONSOLE

A. Type:
   1. Hot wire anemometer sensor.
   2. Direct pressure measurement.
   3. Atmospheric sensor.

B. Provide a Safety Alarm Console to signal unsafe operating conditions whenever fume hood exhaust volumes fall below 80 percent of that specified on the mechanical drawings. The one-unit console shall consist of the following:

1. An audible alarm with a minimum intensity of 60 decibels and a red warning light to both audibly and visibly indicate an unsafe operating condition.
2. Alarm unit shall measure and digitally display linear feet per minute of air flow.
3. Measure and Record fume hood face velocity.

C. Components:
   1. Alarms:
      a. Digital Display: Liquid crystal display indicating current status.
      b. Audible Alarm: As specified above.
      c. Visual Alarm Indicator: Green LED light for normal condition and red LED for low flow and high flow.
      d. Silencer switch: When the silencr switch is activated, the red warning light shall remain"ON" until the unsafe condition is corrected and the alarm unit is manually reset.

D. Adjustment: After the building air handling system has been balanced, adjust the fume hood alarm, and set to activate the alarm whenever the face velocity of fume hoods deteriorates to less than 80 percent of that specified on the mechanical drawings.

E. Mounting: On the front of the fume hood as shown on the drawings, facing to the front. Operate the device on 120 volt A.C., and prewired to the fume hood.

F. Notification Plate: Provide unit with a notification plate. Mount plate on the side of the fume hood housing adjacent to alarm console. Notification shall read as follows:
   1. ALARM WILL ACTIVATE WHEN UNSAFE EXHAUST CONDITION EXISTS
      a. Red lamp and audible alarm will activate.
      b. SHUT DOWN EXPERIMENT AS RAPIDLY AS POSSIBLE.
      c. Close sash.
      d. Report condition to Safety Office personnel.

2.08 FUME HOOD CONTROLLER

A. Fume hood manufacturer's standard fume hood controller.

B. Controller shall provide signal to the Division 23 Building Automation System.

2.09 ACCESSORIES

A. Ceiling Enclosure: Providee ceiling enclosure with removable access panel located on the lower portion of the front panel if access to change lames is required.
   1. Material, color and finish to match fume hood structure.
   2. Ceiling enclosures: extend 6-inches above suspended acoustical panel ceilings and fit flush against gypsum board ceilings.

B. Distillation Rack: 1/2-inch aluminum rod lattice and hardware. Rods spaced at 12-inch nominal.

C. Identification Plate: As specified in Section 11 53 13 "Laboratory Fume Hoods."

2.10 SOURCE QUALITY CONTROL

A. Factory test one fume hood of each type manufactured according to approved shop drawing before shipment.

B. Factory Testing Requirements:
   1. Test Room: Set up test hood in a test room of sufficient size with a minimum of 5 feet clear space in front of the hood and on both sides of the hood for viewing the test.
   2. ASHRAE Std 110 - As Manufactured (AM) test shall includes.
      a. Exhaust Stability Test
      b. Local Visualization Challenge (Low -Volume Smoke Test).
      c. Large-Volume Visualization Challenge (High-Volume Smoke Test).
      d. Face Velocity Testing:
         1) 100 ft/min; with deviation of plus or minus 20 ft/min.
      e. Tracer Gas Containment Testing:
         1) Test to a control level of AM 0.05 ppm or better.

C. Static Pressure Loss for Bench Mounted Fume Hoods:
   1. Face velocity of 75 ft/min (0.38 m/s): Maximum 1/4 inch (6.4 mm) of water gauge.
   2. Face velocity of 100 ft/min (0.51 m/s): Maximum 1/2 inch (13 mm) of water gauge.
   3. Face velocity of 120 ft/min (0.62 m/s): Maximum 1/2 inch (13 mm) of water gauge.
   4. Constant volume fume hoods with bypass: Static pressure and exhaust volume shall be relatively constant regardless of sash position.

D. Face Velocity at Sash Opened 6 inch (152 mm): Maximum 3 times face velocity at sash fully opened.

E. Provide documentation showing the test result. Report of tests previously performed on the same design are acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for fume hood installation.

B. Coordinate for proper installation of plumbing and electrical services.

3.02 PREPARATION

A. Repair, replace, and fix irregularities that will affect the quality of the execution of the work specified.

3.03 INSTALLATION

A. Install fume hoods, plumb, level, rigid, securely anchored to building and adjacent furniture in locations indicated.

B. Provide filler panels between top of hood and ceiling.

C. Provide enclosure panels as indicated.

D. Securely attach access panels but provide for easy removal and secure re-attachment.

E. Do not install damaged units.

F. Comply with requirements in Divisions 22 and 26 for installing water and laboratory gas piping and service fittings and electrical devices.

3.04 INTERFACE WITH OTHER WORK

A. Coordinate with the schedule and other requirements of other work being performed in the area including, but not limited to, casework and work surface installation, mechanical and electrical connections to and in the fume hoods.

3.05 FIELD QUALITY CONTROL

A. Fume Hood Performance Testing Requirements:
   1. Test fume hoods after installation of fume hoods is complete, and the building ventilation and control system has been balanced, and utilities and services connections have been made.
   2. Test fume hood in accordance with SEFA 1 recommendations.
   3. Use ASHRAE Std 110 to determine a benchmark performance.
   4. Owner reserves the right to require a modified version of ASHRAE 110 test or additional testing requirements.

B. Testing Responsibilities:
   1. ASHRAE Std 110, As Installed (AI) test: By Fume hood Manufacturer.
      a. Test all fume hood units installed in the Work of this Project.
      b. (AI) Test methods includes:
         1) Exhaust System Stability Test and Exhaust Flow Stability Test.
         2) Local Visualization Challenge (Low -Volume Smoke Test).
            (a) Fail:

(1) Smoke was visually observed escaping from the hood.

(b) Poor:
(1) Reverse flow of smoke is evident near opening.
(2) Lazy flow into hood along openings.
(3) Slow capture and clearance.
(4) Observed potential for escape.

(c) Fair:
(1) Some Reverse flow in hood not necessarily at opening.
(2) Limited turbulent vortex flow inside hood.
(3) Smoke is captured and clears readily.
(4) No visible escape.

(d) Good:
(1) Good capture and quick clearance.
(2) Limited vortex flow inside hood.
(3) No reverse flow regions.
(4) No visible escape.

3) Large-Volume Visualization Challenge (High-Volume Smoke Test).
(a) Fail:
(1) Smoke was visually observed escaping from the hood.

(b) Poor:
(1) Reverse flow of smoke is evident near opening.
(2) Lazy flow into hood along openings.
(3) Slow capture and clearance.
(4) Observed potential for escape.

(c) Fair:
(1) Some Reverse flow in hood not necessarily at opening.
(2) Limited turbulent vortex flow inside hood.
(3) Smoke is captured and clears readily.
(4) No visible escape.

(d) Good:
(1)
(2) Limited vortex flow inside hood.
(3) No reverse flow regions.
(4) No visible escape.

4) Face Velocity Measurements.
(a) Face velocity grid test: 80 ft/min; +20% or -10% at design opening per ANSI Z9.5.

5) Cross Draft Testing:
(a) Face velocities not to exceed 50 ft/min. with probes 18 inches from the hood opening. Not a pass/fail test if all other tests are satisfactory.

C. Correcting Deficiencies and Retest:
1. If test results of testing specified above are not satisfactory, Fume hood manufacturer and Contractor shall take the following actions:
a. Determine probable cause of deficiencies.
b. Generate solutions for the problems determined in step "a" above.
c. Implement a mitigation plan that include the solutions in step "b" above.
2. Retest the fume hoods and compare the pre- and post-mitigation results to determine the effectiveness of the remedial work on the fume hoods.
3. Repeat the effort until test result is accepted by owner.
4. Remedial work and retest shall not add cost and time delay to the Owner.

3.06 ADJUSTING AND CLEANING

A. Adjust operating equipment and moving parts, with the exception of air handling motors, for smooth and efficient operation for intended use.

1. Sashes: Smooth, near-silent, and accurate operation with one hand and uniform contact of rubber bumpers. Ensure counterbalances operate without interference.
2. Vertical-Rising Sashes: Operate smoothly without tilting when raised or lowered from either end; remain at rest in any open position.
3. Baffles: Set with all openings adjusted to maximum open position.

B. Clean equipment, casework, work surfaces, light fixture lens, both sides of sash, and other surfaces as recommended by manufacturers, rendering work in new and unused appearance.

C. Clean adjacent construction and surfaces soiled in the course of installation of this work.

D. Touch up minor damaged surfaces caused by installation.

E. Replace damaged and defective components that cannot be repaired to new condition.

3.07 PROTECTION

A. Provide protective measures to prevent equipment and surfaces from exposure to other construction activity.

3.08 DEMONSTRATION AND TRAINING

A. Demonstrate fume hood operations and functions to Owner designated representatives at completion of installation.

END OF SECTION

SECTION 11 53 15 - CANOPY HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Canopy hoods and steam dams.

1.02 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions, adjusting and balancing methods.

B. Shop Drawings: For each custom fabricated unit, provide drawings showing details of construction, dimensions, and interfaces with adjacent construction.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 HOOD APPLICATIONS

A. Canopy Hoods Type: Custom-fabricated.
   1. Hood Configuration and Size: As indicated on the drawings.
   2. Exhaust Duct Size: coordinate with size and connection indicated on HVAC drawings and specifications.

2.02 HOOD CONSTRUCTION

A. Canopy Hoods: Provide Type II hoods with all joints and seams liquid-tight.
   1. Inside the bottom perimeter provide an integral formed condensate gutter:
   2. Gutter Dimensions: Minimum 1 inch wide with minimum 3/4 inch flange turned up at 90 degree angle.
   3. Drain: Stainless steel, one inch diameter, located in back corner of gutter. Provide stainless steel cap at drain for future connection.

B. Construction: All materials, inside and out, stainless steel complying with ASTM A666, Type 304, stretcher leveled; unless otherwise indicated.
   1. Sheet Thickness: 14 gauge, 0.075 inch, minimum.
   2. Fabrication: Fabricate each individual hood in one piece, with all welds continuous, ground flush and finished to match (inside and out).
   3. Seams to be fully welded and ground smooth for the length of the seam. Tack welds are not acceptable.
   4. Finish on Surfaces Exposed to View: No. 4 (brushed directional); provide stainless steel faces on all sides exposed to view.
   5. Finish on Concealed Surfaces: No. 4 or No.2 B (dull, matte).
   6. Duct Collars: For exhaust and make-up air openings, provide duct collar welded to hood unit. Coordinate type of connection with HVAC exhaust ductwork.
   7. Supports: Stainless steel mounting brackets, struts, and threaded hanger rods.
      a. Hanger Rods: 3/8 inch diameter, minimum.
      b. Hanger Spacing: 48 inches on center, maximum.
      c. Attachment to Structure: Concealed mechanical fittings or inserts, stainless steel.

8. Accessory Panels: Where indicated, provide filler and closure panels of same construction as hoods, to close spaces between hoods and adjacent construction; mount with panel face flush with face of hood.
   a. Where top of ceiling hung hood is lower than the finished ceiling, provide panels to close space between top of hood and ceiling.
   b. Where back of hood must be set away from wall, provide filler panels to close space between hood and wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that overhead supports are installed in correct locations.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Coordinate construction and installation with ceiling conditions and access panels for any adjacent equipment.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and NFPA 96.

B. Install hoods level and plumb, securely fastened, with seismic restraints as specified, and free of vibration during normal operation.

C. Continuously weld hood duct collars to ductwork, liquid-tight.

D. Coordinate with other trades for connections and location of other utilities.

E. Supports and attachments for supports are to be concealed above ceiling.

3.04 CLEANING

A. Clean surfaces of equipment.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Final Acceptance.

END OF SECTION

SECTION 11 81 29 - FACILITY FALL PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended access anchorage system for all portions of main building facade. Provide independent anchorage for access and for fall arrest.

B. Personal fall arrest anchorage system for portions of roof where parapet does not extend to 42 inches (1067 mm) tall.

C. Systems that provide a safe working access for future roof-top maintenance activities.

D. Systems that provide a safe working access for future window washing activities.

E. Systems that provide a safe working access for future inspection and light maintenance (hand-held tools) of facades.

1.02 DESIGN REQUIREMENTS

A. The architectural drawings illustrate a design concept for guidance of the system design engineer (Qualified Person) as to the Owner's intentions regarding working access. The architectural drawings illustrate a concept, only, and are not exhaustive; the Contractor is responsible for providing a final design in compliance with OSHA requirements within the Contract Price without change order on account of variances, if any, between the Contractor's final design and the concept drawings. The system design engineer (Qualified Person) shall be solely responsible for the design and certification of the system.

1.03 REFERENCES

A. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.

B. 29 CFR 1910, Subpart D - Walking-Working Surfaces, 1910.21-1910.30; current edition.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2021).

1.04 SUBMITTALS

A. Product data.

B. Qualifications:
   1. Manufacturer and installer insurance certificates.
   2. Welder certification.

C. Shop drawings: Sealed by the system design engineer.
   1. System layout.
   2. Show rated and ultimate loads imposed by each component that connects to the building structure.
   3. Identify materials and illustrate details of attachment to building structure.
   4. Identify shop and field welds with AWS welding symbols.

D. Project Closeout Documentation:
   1. Project Record Documents (as-builts) bearing the system design engineer's seal.
   2. Detailed user instructions for delivery to the Owner:
      a. Manufacturer's name, address, and telephone number.
      b. Manufacturer's user instructions for each part, with model number.
      c. Statement of manufacturer's intended use and purpose of each system.
      d. Description of proper methods and limitations on use of each system.
      e. Printed information or illustrations of fixed equipment markings.
      f. Description of detailed inspection and recertification procedures for each system.
      g. Criteria for failing inspections and determining unusable equipment.
      h. Procedures for maintenance and repair requirements.
      i. Identification of who is authorized to make adjustments and and repairs to equipment.
      j. Appropriate warnings regarding altering, misusing, and limitations of equipment.
   3. Approved copies of shop drawings.

4. Results of load testing at the rated load.
5. System design engineer's certification: Documentation that system was installed in accordance with manufacturer's instructions, and has been inspected and anchorages certified.
6. Manufacturer's warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide products of a manufacturer who has specialized in products specified in this section for not less than 10 years. Manufacturer shall carry products and completed operations liability insurance in an amount of not less than $5,000,000.

B. Installer Qualifications: Trained or qualified by manufacturer. Installer shall carry products and completed operations liability insurance in an amount of not less than $5,000,000.

C. Welding: Comply with AWS D1.1/D1.1M. Employ only welders certified per AWS procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products of one of the following:
1. Diversified Fall Protection; 350 Green Oaks Parkway, Holly Springs, NC 27502; fallprotect.com.
2. Guardian Fall Protection; 607 East Sam Houston Parkway South, Suite 800; Pasadena, TX 77503; www.guardianfall.com.
3. Pro-Bel; 29640 Union City Boulevard, Union City, CA 94587; www.pro-bel.com.
4. Rooftop Anchor, Inc.; 875 S 600 W, Heber City, UT 84119; www.RooftopAnchor.com.

2.02 SYSTEM DESIGN REQUIREMENTS

A. Engineering Design / System Design Engineer:
1. Design systems and manufactured units under the direct supervision of a Professional Engineer registered in the State in which the Project is located.
2. Engineer shall be a Qualified Person as defined by OSHA with extensive experience and expertise in design of fall protection.
3. Verify that building structural components to which system components will be anchored are adequate to resist the imposed loads. Design component anchorage within the allowable limits of the existing structure; where necessary provide additional reinforcing to distribute imposed loads within allowable limits of the existing structure.

B. Design systems and manufactured units in compliance with applicable codes and regulations, including:
1. OSHA 29 CFR 1910, Subpart D - Walking-Working Surfaces.
2. OSHA 29 CFR 1910.66 Powered Platforms for Building Maintenance.
3. OSHA 29 CFR Subpart M 1926.501-503 Fall Protection.
4. North Carolina Department of Labor's Occupational Safety & Health Administration regulations, including 13 NCAC 07F.0101and 13 NCAC 07F.0201.
5. North Carolina Building Code.

C. Employ systems and components thereof in continuity with other fall protection systems extant throughout the campus; utilize compatible components.

D. Waterproofing:
1. Each point of connection to the building shall be designed to provide permanent watertight protection without the need for maintenance or relying on recaulking.
2. Each point of connection through the roof covering or through wall cladding shall allow for subsequent repair, removal, and reinstallation of roofing or wall cladding components without affecting the integrity of the connecting element.

E. Fall or Impact Loads During Normal Use:
1. Each component shall be designed so as to sustain the full design load during use without damage, deformation, or the need to replace or renew components or parts thereof,

providing however that after an impact event such components shall be immediately removed from service and reinspected and recertified before returning such components to use.

2.03 MANUFACTURED UNITS

A. Roof-top Anchors.

B. Wall Anchors.

C. Horizontal Lifelines and connection devices.

D. Personal Equipment:
   1. Provide 3 each harnesses, shock-absorbing lanyards, and clips.

2.04 MATERIALS

A. Materials exposed to the weather: Stainless steel.

2.05 IDENTIFYING DEVICES

A. Provide at each roof access point a Roof Plan, laminated in plastic and affixed within a picture frame, mounted to the wall. Show:
   1. Fall protection system locations.
   2. Anchor load ratings.
   3. Number of authorized simultaneous users of each system or component.
   4. Date of initial certification.
   5. Name of professional engineer who designed the system and certified anchorages, and the design engineer's seal.

B. Provide at each roof access point the following information, laminated in plastic and affixed within a picture frame, mounted to the wall:
   1. Emergency contact information (obtain from the Owner).
   2. Emergency rescue procedures.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install systems in accordance with manufacturer's instructions and approved shop drawings.

3.02 LOAD TESTS

A. Test anchorage assemblies and fall arrest equipment at the rated load.

B. Load test as prescribed, defined, and certified by the system design engineer.

C. Determine elastic deformation of the test anchorage or anchorage connector in accordance with calculations performed and certified by the system design engineer.

3.03 INSTRUCTION

A. Provide on-site instruction and training of Owner's personnel in proper use of systems.

END OF SECTION

SECTION 12 24 13 - WINDOW SHADE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manually-operated window shades and accessories.

1.02 SUBMITTALS

A. Product Data: Manufacturer's catalog data, product descriptions, installation instructions, detail sheets, and specifications for each type system specified.
   1. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, and instructions for operating hardware and controls.

B. Samples for Verification: Shade fabric sample and paint finish as selected.

C. Shop Drawings: Show dimensions and interface with other products.
   1. Room schedule including field-verified dimensions of each opening to receive window shade system.
   2. Use same room designations as indicated on Drawings. Key to typical mounting details.
   3. Indicate model number, operator, fabric selection, and mounting type.
   4. Indicate control type and provide zone schedule if necessary.

D. Closeout Submittals:
   1. Warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience installing products comparable to those specified in this section.

B. Mock-up: Provide a mock-up of each window shade system for evaluation of mounting, appearance and accessories.
   1. Mock-up may remain as part of the work.
   2. Locate mock-up in window designated by the Architect.
   3. Do not proceed with remaining work until, mock-up is accepted by the Architect.

1.04 WARRANTY

A. Roller shade hardware, chain and shade fabric: Manufacturer's standard warranty.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original cartons.

B. Individually package and mark shades with room number and opening number.

C. Inspect the materials upon delivery to assure that specified products have been received.

D. Store and handle shades to prevent damage to fabrics, finishes, and operators prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Mechoshade Systems LLC: www.mechoshade.com.

B. Hunter Douglas: www.hunterdouglasarchitectural.com.

C. Springs Window Fashions; SWF Contract: www.SWFcontract.com.

2.02 SHADE SYSTEMS

System 1 (SS1): Manual window shade, Fabric 1, regular roll direction, mounted outside window frame in shade pocket, chain operated control.

System 2 (SS2): Manual window shade, double roller with blackout, Fabric 2 and Fabric 3, regular roll direction, mounted outside window frame, chain operated control.

2.03 FABRIC

A. Fabric 1: Solar Control.
   1. Basis of Design: Mechoshade, Eco Veil Screens – 126” W:
      a. Openness factor: 1%
      b. Pattern: 1750 Series
      c. Color: As selected by Architect from manufacturer's standard range
   2. Hunter Douglas, SheerWeave Infinity2:
   3. SWF Contract, Eternity E100:

B. Fabric 2: Solar Control.
   1. Basis of Design: Mechoshade, Eco Veil Screens:
      a. Openness factor: 3%
      b. Pattern: 1550 Series
      c. Color: As selected by Architect from manufacturer's standard range
      d. Width: 126 inches.
   2. Hunter Douglas, SheerWeave Infinity2:
   3. SWF Contract, Eternity E300:

C. Fabric 3: Room Darkening.
   1. Basis of Design: Mechoshade, Chelsea Blackout:
      a. Openness factor: Opaque
      b. Pattern: 0250 Series
      c. Color: Solid Graphite
   2. Hunter Douglas, SpartaTwilight:
   3. SWF Contract, Conceal:

2.04 MANUALLY OPERATED WINDOW SHADE SYSTEM

A. Products:
   1. Mechoshade; Mecho/5 system.
   2. Hunter Douglas: Architectural, RB 500+.
   3. Springs Window Fashions; SWF Contract; Pro Series Manual Solar Shades.

B. Chain Operation: Bi-directional wrap spring clutch shall allow for shade to stop and hold at any position.

C. Chain Operator Position: Right-hand side, unless otherwise noted on drawings.

D. Bead Chain: No. 10 stainless steel.

E. Clutch mechanism: Fabricated from high carbon steel.
   1. Components fabricated from styrene based plastics, polyester or reinforced polyester are not acceptable.

2.05 SHADE COMPONENTS

A. Rollers:
   1. Shade roller tube shall be extruded aluminum of diameter and wall thickness required to support shade fabric. Maximum allowable deflection L/700.
   2. Rollers shall be easy to remove from support brackets.

B. Mounting Brackets: Stamped steel, custom fabricated as required for mounting style indicated.

C. Hembar: Concealed.
   1. Shape: Manufacturer's standard.

2.06 ACCESSORIES

A. Finish for accessories, unless otherwise noted: White baked enamel.

B. Fascia: L-shaped extruded aluminum shall conceal mounting hardware, roller tube, and fabric rolled on tube.

C. Pocket: Extruded aluminum shall conceal mounting hardware, roller tube, and fabric rolled on tube.

D. Fascia/Pocket End Caps: Provide end caps where mounting conditions expose outside of roller shade brackets.

2.07 SHADE FABRICATION

A. Shades mounted outside window frame: Shade fabric shall overlap window opening 3/4 inch.

B. Shade fabric shall hang flat without buckling or distortion and in the same direction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Correct unsatisfactory substrates before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Verify that blocking and framing necessary to carry shade assembly hardware is properly installed and secure.

3.03 INSTALLATION

A. Install window shade systems level, plumb, square and true according to manufacturer's written instructions and these specifications.

B. Adjust and balance roller shades to operate smoothly, safely and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.04 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 12 35 53 - LABORATORY CASEWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Metal laboratory casework.
   2. Laboratory work surfaces.
   3. Laboratory sinks.
   4. Water, laboratory gas, and electrical services fittings.
   5. Emergency showers
   6. Overhead service carriers.
   7. Ceiling service panels.
   8. Free standing safety storage cabinet.
   9. Heavy duty shelving.
   10. Fume extraction devices.
   11. General laboratory accessories.

1.02 RELATED REQUIREMENTS

A. Section 11 53 13 - Laboratory Fume Hoods.

B. Section 11 53 14 - Polypropylene Laboratory Fume Hoods

1.03 REFERENCES

A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2021, with Amendment (2020).

F. SEFA 2.3 - Installations; 2010.

G. SEFA 7 - Laboratory Fixtures; 2010.

H. SEFA 8M - Laboratory Grade Metal Casework; 2016.

I. SEFA 10 - Adaptable Laboratory Furniture Systems; 2013.

J. UL (ECMD) - Electrical Construction Materials Directory; current edition.

1.04 DEFINITIONS

A. Abbreviations:
   1. CFM: Cubic feet per minute.
   2. MDF: Medium-density fiber board.
   3. PSI: Pound per square inch.
   4. PVC: Polyvinyl chloride.
   5. PVDF: Polyvinylidene fluoride.

B. Broom clean: A condition in an interior area in which surface debris has been removed by dry methods.

C. Service fittings and fixtures: Service fittings include gas, air, vacuum, and special gas valves including factory piped turrets when mounted on work surfaces; hot, cold, reagent grade water faucets; remote control valves for fume hoods; and vacuum breakers.

D. Service lines: Conduit, junction boxes, conduit fittings, wire disconnect switches and fuse or circuit breakers necessary to carry electrical services from building roughing-in outlets in floors or walls through equipment to service fixtures.

E. Rough-in point: Individual or common supply of mechanical, electrical, and heating, ventilating and air conditioning (HVAC) through wall, floor, or ceiling, generally located within the utility umbilical, equipment chase, or service space behind cabinets.

F. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, tops of cabinets less than 72 inches above floor, and visible surfaces in open cabinets or behind glazed doors.
   1. Ends of cabinets visible when the full installation is completed, shall be considered exposed.

G. Semi-exposed Surfaces of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interiors faces of doors. Tops of cabinets 72 inches or more above floor, back panel in knee spaces, the three non-visible edges of adjustable shelves, holes and openings including notches at shelving and grommets shall be considered semi-exposed. Toe space shall be considered semi-exposed.

H. Concealed Surfaces of Casework: Includes sleepers, web frames, dust panels, and other surfaces not visible after installation.
   1. Ends of cabinets installed directly against and completely concealed by walls or other cabinets after installation shall be considered concealed.

1.05 SUBMITTALS

A. Submit all of the following on the same date. Submit complete, coordinated data. Partial submittals are not acceptable unless specifically approved by the Architect.
   1. Product data.
   2. Sustainability documentation.
   3. Samples for initial selection.
   4. Shop drawings.
   5. All of the above for this section and for the following Sections:.
      a. Section 11 53 13 - Laboratory Fume Hoods
      b. Section 11 53 14 - Polypropylene Laboratory Fume Hoods.

B. Product Data: Provide manufacturer's data and installation instructions for each type of laboratory casework unit, service fixtures, and accessories.
   1. Certification by an independent testing laboratory indicating that applied finish complies with specified chemical and physical resistance requirements.
   2. Certification by an independent testing laboratory that the casework complies with the specified requirements.

C. Sustainability Documentation: Submit information required by Division 01 sustainable design sections.

D. Delegated Design Submittal: for slotted chanel framing system supporing overhead service carriers.
   1. Signed and sealed by the Professional Engineer responsible for its preparation.
   2. Slotted channel framing is specified in Section 05 43 00 "Slotted Channel Framing."

E. Samples for Initial Selection:
   1. Factory-applied finishes and other materials requiring color selection.

F. Samples for Verification:
   1. Three of each type of casework material with each type of specified finish.
   2. Three of each type of work surface material with each type of specified finish.
   3. Acceptable samples will be used for comparison inspections at project. Retain acceptable sample units in building until completion of work and remove sample units from premises when directed by Architect.

G. Shop Drawings: Large scale plans, elevations, cross sections, and details indicating layouts, dimensions, service run spaces, wall blocking, and attachment to other works.
   1. Indicate locations of hardware .
   2. Indicate locations and type of service fittings.

3. Indicate ceiling service panels and service penetrations..
4. Indicate locations of blocking and reinforcements required for installing casework.
5. Include details of utility spaces showing supports for conduits and pipings.
6. Include details of support framing system.
7. Include coordinated dimensions for laboratory fume hoods specified in other Sections.

H. Contract Closeout Submittals:
1. Project Record Documents:
a. Provide 1 set of record documents including plans, elevations, cross sections, and details indicating layouts, dimensions, service run spaces, and locations and types of service fixtures.
b. Marked up shop drawings and documents will not be acceptable.
2. Cleaning Data: Manufacturer's instructions for cleaning casework finishes and work surfaces
3. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 MAINTENANCE MATERIALS

A. Furnish complete touchup kit for each type and color of metal laboratory casework provided. Include primers, paints, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
1. Cabinet mounting clips and related hardware: quantity equal to 5 percent of amount installed but no fewer than 20 of each type.
2. Specialized casework tools: Two Sets.
3. Provide minimum 2% attic stock/extra material sets for all laboratory gas service fixtures, water service fixtures, and casework hardware.

1.07 QUALITY ASSURANCE

A. Single Source Responsibility: Provide laboratory casework with tops, sinks, service fixtures and accessories, manufactured or furnished by a single laboratory casework company. comply with

B. Integrate fume hoods specified in Section 11 53 13 - Laboratory Fume Hoods and 11 53 14 - Polypropylene Laboratory Fume Hoods with casework as shown on drawings.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

D. Products Requiring Electrical Connection: Listed and classified by UL (ECMD) as suitable for the purpose specified and indicated.

1.08 PRE-INSTALLATION MEETING

A. Convene 1 month before starting work of this section.

1.09 DELIVERY, STORAGE, AND PROTECTION

A. Storage:
1. If installation cannot commence in a timely manner after delivery, casework and equipment may be placed in storage. Additional costs for handling, shipping and storage shall be borne by the Contractor.
2. In the case of items such as service fittings that may be shipped to the job site on larger projects and used over the course of several months installation provide a secure locked storage area for use to safeguard this equipment at the job site prior to installation.

B. Protection:
1. Protect finished surfaces from soiling and damage during delivery, storage and handling. Cover with polyethylene film or other protective covering.
2. Laboratory casework and work surfaces are not to be used as workbenches, work platforms and scaffolding for any portion of the work by any trade. Furniture and

casework, as installed, is considered to be finished equipment and shall be protected from damage by trades.

3. The Contractor shall protect installed laboratory casework and equipment, especially the laboratory work surface, from debris, paint, and damage in the course of the construction sequence.

1.10 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Interior spaces where casework, service fittings, and accessories are to be installed shall be conditioned to final design temperature and humidity level for minimum 24 hours prior to and continuously after installation, and in accordance with SEFA 2.3.
   2. Do not deliver or install casework, tops, service fittings and accessories until the following conditions have been met:
      a. Windows and doors are installed and the building is permanently closed in and weathertight.
      b. Ceiling, overhead ductwork and lighting are installed.
      c. All painting is completed and floor tile is installed.

1.11 SEQUENCING

A. Casework:
   1. Base cabinets and floor supports:
      a. On Resilient Flooring:
         1) Flooring with integral cove base: Install base cabinets after installation of finish flooring and cove.
         2) Flooring without integral cove base: Install base cabinets after installation of finish flooring, before rubber base. Install scheduled wall base at base cabinets unless noted otherwise.
      b. On Resinous Flooring: Install base cabinets after installation of finish flooring and cove.
   2. Base and wall cabinets:
      a. Painted walls: Install cabinets after last coat of paint.

1.12 WARRANTY

A. Casework: Provide written warranty signed by the manufacturer guaranteeing to correct failures in products which occur within one year commencing on the Date of Final Acceptance, without reducing or otherwise limiting any other rights to correction which the Owner may have under the Contract Documents. Correction may include repair or replacement.
   1. Defects include, but are not limited to:
      a. Ruptured, cracked, or stained finish coating.
      b. Discoloration, or lack of finish integrity.
      c. Cracking or peeling of finish.
      d. Weld or any other structural failure.
      e. Failure of hardware.

B. Work Surface: Provide written 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

C. Warranties shall commence on Date of Final Acceptance.

PART 2 PRODUCTS

2.01 SUSTAINABILITY REQUIREMENTS

A. The work of this Section may be counted toward meeting Sustainable Design requirements specfied in Division 01 substainability sections.

B. Indoor Environmental Quality - Low-Emitting Materials - Composite Wood & Agrifiber Products.

1. Composite Wood and Agrifiber Products: Composite wood and agrifiber products used on the inside of the building (inside of the weatherproofing system) shall contain no added urea formaldehyde resins.
    a. Laminating adhesives used to fabricate on-site and shop applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

2.02 MANUFACTURERS

A. Source Limitations: Provide laboratory casework through the same source from a single manufacturer.

B. Obtain laboratory casework through the same source from the same manufacturer as laboratory fume hoods specified in Section 11 53 13 - Laboratory Fume Hoods.

C. Metal Casework:
1. A.T. Villa; Milwaukee, WI, 800-554-9259: www.atvilla.com.
2. Bedcolab Ltd; Laval, Quebec, Canada, 800-461-6414: www.bedcolab.com.
3. Kewaunee Scientific Corporation; Statesville, NC, 704-873-7202: www.kewaunee.com.
4. Mott Manufacturing Ltd, Brantford, ON, Canada, 519-752-2895: www.mott.ca.

D. Fixtures and Accessories:
1. As listed by individual items below.

2.03 PERFORMANCE REQUIREMENTS

A. Casework and Adjustable Shelving:
1. Loading Requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation when tested in accordance with SEFA 8M.
    a. Base unit load capacity:
        1) 200 lb per square foot of cabinet top area.
        2) Leveling bolts: 500 lb each; minimum one per corner of each base cabinet.
    b. Drawers in a cabinet: 150 lb uniform load with smooth operation for minimum 10,000 cycles of opening and closing.
    c. Tables, 4 legged: 300 lb.
    d. Hanging wall cases: 300 lb.
    e. Shelves:
        1) Shelves inside base cabinets, wall and tall cabinets: 100 lb.
        2) 40 lb/sf up to a maximum of 200 lb with nominal temporary deflection, but without permanent set.
2. Chemical Resistance Requirements: Test the exterior finish of laboratory casework and adjustable shelving for resistance to chemical reagents in accordance with SEFA 8M, and meets Level 1 rating - slight change in color or gloss, and with no loss of adhesion and no loss of film protection.
    a. Moisture Resistance: No visible effect when finish surface exposed to the following:
        1) Tested in accordance with SEFA 8.
        2) Constant Moisture using a 2 inch x 3 inch x 1 inch cellulose sponge, soaked with water, in contact with surface for 100 hours.
    b. Cold Crack: No effect when subjected to 10 cycles of temperature change from 20 degrees F for 60 minutes to 125 degrees F for 60 minutes.
        1) Adhesion: Tested in accordance with SEFA 8; ninety or more squares of the test sample shall remain coated after the scratch adhesion test.
        2) Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a 1/2 inch diameter mandrel.
    c. Hardness: Tested in accordance with SEFA 8 for surface hardness equivalent to 4H or 5H pencil.
    d. Abrasion resistance: Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrase #CS10 wheel.

e. Humidity resistance: Withstand 1000 hour exposure in saturated humidity at 100 degrees F.
f. Salt spray: Withstand minimum 200 hour salt spray test.

2.04 PRODUCT OUTLINE

A. Numbering system indicated in the casework drawings legend are provided to indicate casework size, and configuration.

B. Metal Cabinets:
1. Material: Cold rolled sheet steel.
a. Where laboratory casework is indicated to be constructed of stainless steel, provide material compliant with ASTM A666.
2. Design, Color, and Finish:
a. Cabinet Construction and Door Style: Flush inset metal door.
b. Finish: As follows.
1) Cold-rolled steel: Powder coated, complying with SEFA 8.
2) Stainless steel: #4 finish.
c. Color: White.

2.05 MATERIALS

A. Sheet Steel:
1. Mild, cold rolled and leveled unfinished steel.
2. Minimum gauges:
a. 20 gauge: Interior drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, access panels and sloping tops.
b. 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, and access panels.
c. 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.
d. 16 gauge: Ceiling service panels.
e. 14 gauge: Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.
f. 11 gauge: Table leg corner brackets, adjustable table legs, and gussets for leveling screws.

B. Stainless Steel Sheet: ASTM A666 Type 304.

C. Glass: ASTM C1048, fully tempered using horizontal tempering; exposed edges ground, and cut or drilled to receive hardware.
1. Framed doors: 1/8 inch (3.2 mm) thick glass.
2. Unframed sliding glass doors: 1/4 inch (6.4 mm) thick glass.

D. Sound Deadening Material at Stainless Steel Work Surface: Inorganic, noncombustible, noncorrosive, sprayed on type.

E. Sealant: Mildew-resistant silicone, specified in Section 07 92 00 - Joint Sealants.

2.06 CASEWORK HARDWARE

A. Drawer and Hinged Door Pulls: 4 inch bar pull type, surface mounted with through-bolt from back, Stainless steel, No. 4 finish. Provide 2 pulls for drawers over 24 inches in width. Pull shall meet State and Federal Accessibility Regulations.

B. Hinges:
1. Institutional type five knuckle, minimum 2-1/2 inch long, wrap around design.
2. Finish: Stainless steel, No. 4.
3. Provide two hinges for doors up to 36 inches; three hinges for doors over 36 inches high.

C. Catches:
1. Roller Catch: Adjustable type, spring actuated polyethylene roller and steel strike plates.

2. Positive Catch: A two-piece heavy-duty cam action positive catch. Main body of the catch shall be confirmed within an integral cabinet top or divider rail, while latching post shall be mounted on the hinge side of door.

D. Drawer Slides:
1. Manufacturers:
a. Basis of Design: Subject to compliance with requirements, provide slides by Accuride International, Inc.; model number as specified in sub-paragraphs below. Comparable products may be provided by the Manufacturers listed below.
b. Hafele America Co.
c. Knape & Vogt Manufacturing Company.
2. Light/Medium Duty Drawer Slides For Drawers 24 inches (609 mm) Wide or Less: Accuride 7434 with overtravel.
a. Overtravel: 1 inch (25 mm).
b. Type: All ball bearing, full extension, rail-mounted, hold-in detent, smooth progressive movement.
c. Capacity: 100 pounds (45 kg) per pair for 18-inch (457 mm) slide length.
d. Finish: Clear zinc.
3. Heavy Duty Drawer Slides For Drawers 48 inches Wide or Less and Standard File Drawers: Accuride 3640A.
a. Type: All ball bearing, full extension, rail/bracket-mounted, hold-in detent, smooth progressive movement with 1 inch (25 mm) overtravel.
b. Capacity: 200 pounds (90 kg) per pair for 18-inch (457 mm) slide length.
c. Finish: Clear zinc.
4. The drawer shall be removable without the use of tools and yet prevent inadvertent drawer removal.

E. Locks:
1. Type 1: Heavy duty cylinder type. Exposed lock noses shall be dull nickel, satin plated, and stamped with identifying numbers.
a. Disk Tumbler: Locks shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.
b. Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:
1) Two for each keyed different lock.
2) Three for each group of keyed-alike locks.
3) Two for master keys for each system.
c. Provide locks on all cabinet doors and drawers.

F. Shelf clips: Twin pin type for mounting on interior of cabinet end panels. Clips shall be corrosion resistant and shall retain shelves from accidental removal. Shelves shall be adjustable on 32 mm centers.

G. Leg shoes shall be provided on all fixed height table legs, unless otherwise specified, to conceal leveling device. Shoes shall be 2-1/2 inch (64 mm) high and a pliable, black vinyl material.

H. Floor glides, where specified for movable open-leg tables, shall be a non-marring material at least 1 inch (25 mm) dia. to prevent indenting composition flooring and shall have at least a 5/8 inch (16 mm) height adjustment. Use of metal buttons will not be acceptable.

2.07 MODULAR FIXED BASE AND WALL MOUNTED CABINETS - METAL

A. General Requirements:
1. For flush overlay style cabinet:
a. Door and drawer design: Square edge flush. Door and drawer, when closed, shall rest against face of cabinet shell.
b. Apron: Flush with doors and drawers.
1) Provide applied panel at sink base.

B. Base Cabinet:

1. Cabinet Bottom and Bottom rail:
   a. Formed of one piece of steel.
   b. Formed down on side and back to create square edge transition welded to cabinet end panels.
2. Back: Cupboard unit only shall be provided with removable back panel.

C. Wall Cabinet - Up to 36 inches high:
1. End Panels and Backs: Formed of one piece wrap around design with internal reinforcing front and rear posts.
2. Tops and Bottoms: One piece with front edge formed into front rail.
3. Doors:
   a. Solid panel doors: 3/4 inch thick, double wall, box construction, structurally rigid. Assembled with interior sound deadening.
   b. Frame glazed doors:
      1) One piece welded, exterior and interior head frame. Interior head frame to be removable for installation and replacement of glass.
      2) Provide vinyl glazing retainer to receive glass.
      3) All other aspects of framed glazed door construction and quality shall match solid panel door.
   c. Hinged doors shall close against rubber bumpers.

D. Metal Doors
1. Solid panel doors: 3/4 inch thick, double wall, box construction, structurally rigid. Assembled with interior sound deadening.
2. Frame glazed doors:
   a. One piece welded, exterior and interior head frame. Interior head frame to be removable for installation and replacement of glass.
   b. Provide vinyl glazing retainer to receive glass.
   c. All other aspects of framed glazed door construction and quality shall match solid panel door.
3. Hinged doors shall close against rubber bumpers.

2.08 ACID STORAGE CABINETS - METAL.

A. One-piece corrosion resistant interior liner, including the backside of doors and shelf surfaces.

B. One-piece corrosion resistant insert tray with 2 inch lip for containment of spills at bottom of cabinet.

C. One removable shelf with 1 inch lip, ajustable on 1 inch increments.

D. Ventilation:
1. Provide louver at top and bottom of each door.
2. When mounted below or adjacent to fume hoods, vent acid storage cabinet into fume hood. Provide 1-1/2 inch I.D., corrosion resistant, vent pipe up to fume hood enclosure. Locate vent openings at rear of fume hood work area with raised lip to avoid acting as drain for work surface. Seal opening between working surface and pipe with chemical resistant material. Vent shall provide positive airflow directly into the fume hood exhaust system. Vent pipe color to match work surface.

E. Exhaust ports shall have fire screens.

F. Non-metal door catch or strike plate.

G. Front of cabinet labeled with minimum 1 inch high, 1/4 inch stroke red letters: "ACID"

H. Color and Finish: Match metal base cabinets.

I. Design: Match metal base cabinets.

2.09 FLAMMABLE LIQUIDS STORAGE CABINETS - METAL.

A. Identified for flammable and combustible liquids shall be constructed in compliance with UL, OSHA, and NFPA 30.

B. Self closing and self latching doors synchronized so that both doors will always fully close.

C. Bottom of the cabinet liquid tight to a height of 2 inches.

D. Cabinet shall not have vent outlet.

E. Front of cabinet labeled with minimum 1 inch high, 1/4 inch stroke red letters: "FLAMMABLE - KEEP FIRE AWAY".

F. Color and Finish: Match metal base cabinets.

G. Design: Match metal base cabinets.

2.10 WALL MOUNTED ADJUSTABLE SHELVES

A. Metal Shelves: Formed powder-coated sheet steel finished to match adjacent casework.
   1. Form sides of metal shelves minimum 1-inch high.

B. Stainless Steel Shelves: 16 ga Type 304/306 stainless steel, #4 satin finish.
   1. Form shelves down 1 inch; return back and up into a channel formation.
   2. Reinforce shelves over 48 inches long with an additional 20 gauge steel hat channel welded to the underside.
   3. Reinforce shelves 12 inches deep and greater with an additional 20 gauge hat channel welded to the underside.

C. Shelf Depth: Refer to LC Drawings.

D. Shelf Lengths: Shall be available in 1 inch increments to 48 inch length. Match the length of the structural module.

E. Support System for Adjustable Shelves:
   1. Wall mounted shelf support: Double-slotted standards.
   2. Counter top mounted shelf support: Tubular shape with slotted holes.
   3. Adjustable height: Adjustable on 1 inch increments.
   4. Color and finish: Powder coated steel to match metal casework.
   5. Coordinate the location of wall blocking for shelves prior to the closing-in of the walls.

F. Brackets:
   1. Book end type; Powder coated steel to match metal casework; 11 gauge; mount to inner slot of double slotted support module upright.
   2. Match brackets provided at Movable Bench System. Powder coated steel to match metal casework; 11 gauge; mount to inner slot of double slotted support module upright.
   3. Fasten shelves to brackets with two stainless steel screws per bracket

2.11 FREE STANDING, ADJUSTABLE HEIGHT TABLES - METAL

A. Basis of Design: Kewaunee Enterprise Adaptable Movable Workstations - Free-standing Table Frame.

B. Material:
   1. Tops: 1 inch thick resin to match resin work surfaces.
   2. Aprons, legs and rails: Powder coated steel to match adjacent casework.

C. Table Frames:
   1. Front Apron: 2 inches high.
   2. Side and Back: Manufacturer's standard.
   3. 11 gauge powder coated steel.

D. Rails and Stretchers: Provide sides and back rail as required. No stretcher rail.

E. Legs: 2 inch by 2 inch steel tube with stainless steel telescoping leg insert.
   1. Leg corner bracket: Welded construction with bolted attachment of leg to apron.

F. Adjustable at height from 30 inches to 36 inches inclusive of 1 inch table top.

G. Adjustable portion of legs shall be drilled at 1 inch increments. Provide two (2) removable stainless steel bolted connections per leg.

H. Design Loads: Per SEFA 8M, with a minimum of 600 lb rating for a 72 inch x 30 inch at 36 inch high freestanding table.

2.12 WORK SURFACES

A. General:
1. Fabricate components in shop to greatest extent practical to sizes and shapes indicated.
2. Provide holes and cutouts for service fixtures, service fittings, and service outlets.
3. Fabrication tolerances:
a. Size:
1) Length: +/- 1/16 inch (1.6 mm).
2) Width: +/- 1/16 inch (1.6 mm).
3) Thickness: +/- 1/16 inch (1.6 mm).
b. Cutouts:
1) Sinks: +/- 1/8 inch (3.2 mm).
2) gem box: +/- 1/8 inch (3.2 mm).
3) Columns: + 1/8 inch (3.2 mm), - 0 inch (0 mm).
4) Column cut-out, covered by applied curb: + 1/4 inch (6.4 mm), - 0 inch (0 mm).
5) Service drilling: + 1/8 inch (3.2 mm), - 0 inch (0 mm).

B. Solid Phenolic Composite Resin Work Surface – Chemical Resistant
1. Manufacturers, product and color:
a. Durcon Inc; Taylor, TX, 512-595-8000: www.durcon.com.
1) Solicor-CR: Graphite.
b. Trespa North America: www.TrespaNorthAmerica.com.
1) Trespa TopLab Plus: Slate Gray with gray core.
c. Wilsonart; Temple, TX, 800-433-3222: www.wilsonart.com.
1) Solicor-CR: Graphite.
2. Material: Solid phenolic composite resin with solid color core.
3. Thickness: 1 inch.
4. Finish: Matte.
5. Back and Side Splash: Same material as top.
a. Height: 4 inches (102 mm) unless noted otherwise on Drawings.
b. Thickness: 3/4 inch.
c. Fabrication: Butt jointed and cemented to work surface.
d. Location: Where work surfaces abut walls, adjacent tall cabinets and adjacent fume hoods. Include end curb where required.
e. Curbs shall be bonded to the top of the work surface to form a square joint. Joints between sections of curb shall be stepped or mitered as necessary to minimize the amount of core exposed.
6. Edge: See work surface type on Drawings.
7. Marine edge and work surface at sink locations. Refer to Drawings.
a. Thickness: 3/4 inch work surface with applied 1/4 inch marine edge.
8. Drip groove 1/8 inch wide by 1/8 inch deep set back 1/2 inch from the work surface edge on the underside of each exposed edge.
9. Joints to match color of work surface.
10. All exposed edges to be sanded to a smooth finish. Finish all exposed edges.
11. Form tight-fitting butt joints in the work surface positioned to be concealed after installation.
12. Cutouts for under-mounted sinks shall be routed and sanded to form smooth edged openings with the top edge radiused to approximately 1/8 inch. The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than 3/4 inch. Under-mounted sinks shall be supported by brackets blind-fixed to the underside of the work surface.
13. Flame spread ASTM E84: Class 1A (25). Non-porous surface and edges. Will not support micro-organic growth.

C. Stainless Steel Work Surface:
1. Material: 14 ga, Type 304 stainless steel, No. 4 finish.
2. Edge Thickness: 1 inch (25 mm) thick at exposed edges.
3. Fabrication:
a. Fabricate stainless steel work surface without plywood backing board.
b. Top surface, rear curb, and rear or top edge shall be one piece without seams or joints.
c. Seams and joints: Fully welded with stainless steel fillers, ground smooth and blended to specified finish.
1) Create joint only when top length cannot be fabricated in one piece.
d. Reinforcing: Steel channels welded to underside of work surface to prevent twisting, oil canning, and buckling.
e. Edge: Square edge.
1) Form tops with 1 inch high edge and 1/2 inch return flange.
2) Edge Reinforcement: 16 gauge stainless steel channel welded to return flange and underside of top surface.
3) Provide continuous sealant to cover seams between reinforced channel and edge of return flange.
f. Marine Edge:
1) Seamless, 3/16 inch high integral raised rim.
2) Provide where indicated and at work surface with sink.
g. Backsplash: 4 inches (102 mm) high; coved and integral with top surface; 45 degree chamfered top edge.
h. Sound deadening: 1/8 inch thick heat resistant material to prevent condensation and deaden sound. Do not apply to exposed surfaces .
i. Integral Sink:
1) Where stainless steel sinks occur in stainless steel tops, factory assemble sinks and tops into one integral unit with welds ground and polished.

2.13 LABORATORY SINKS

A. General:
1. Sizes: See sink schedule on Laboratory Casework drawing.
2. Provide overflow, strainer and tailpiece with sink.

B. Cast Epoxy Resin Sinks:
1. Manufacturers:
a. Durcon, Inc. A Wilsonart Company; Taylor, TX, 512-595-8000: www.durcon.com.
b. American Epoxy Scientific, LLC.; Mountain Home, AR. 870-701-5015. www.americanepoxyscientific.com.
c. Kewaunee Scientific Corp.; Stateville, NC. 704-873-7202. www.kewaunee.com.
2. Molded in one piece with smooth surfaces, coved corners, and bottom sloped to drain.
3. Material: Cast epoxy resin.
4. Mounting: Underhung.
5. Color: Match Work Surface.
6. Finish: Matte.

C. Integral stainless Steel Sink: Refer to Stainless Steel Work Surface above.

D. Stainless Steel Scullery Sinks:
1. Manufacturers:
a. BSM Inc., www.globalindustrial.com.
b. Elkay USA, www.elkay.com.
c. Just Manufacturing Company, www.justmfg.com.
d. Mortech Manufacturing, Inc., www.mortechmfg.com.
e. Mott Manufacturing, Ltd., www.mott.ca.
2. Basis of Design:
a. Single Compartment, 2-station, with no drainboard:

1) Subject to compliance with requirements, provide BSM Inc.; WRB2309442/021K42208L; Comparable products may be provided from the manufacturers listed above.
   (a) NSF and ETL approved.
   (b) Construction: continuously welded and ground smooth.
   (c) Mounting: at wall with two front legs.
   (d) Single Compartment: 42" long x 20" wide x 8" deep.
   (e) Drain: 1-1/2 inch diameter.
   (f) Knee operator: Manufacturer's standard pedal mounted at knee height.
   (g) Soap dispenser: 40 oz. electronically-activated stainless steel housing.

3. Construction:
   a. 14 gauge, stainless steeel, type 304, satin finish.
   b. Welded 1/4 inch radius coved corners. Full length integral backsplash with sloped top. Stainless steel tubular legs with adjustable feet.
   c. Integral drainboard.
   d. Size: See sink schedule on Laboratory Casework drawing.

E. Outlets and Tailpiece:
   1. Inlet: 1/2 inch (13 mm) diameter.
   2. Tailpiece: Minimum 6 inch long with 1-1/2 inch NPT outlet.
   3. Accessory: Strainer.
   4. Material: Same material as sink.

F. Overflows:
   1. Size: 2 inches (52 mm) less than sink depth.
   2. Material: Polypropylene.
   3. Configuration: Open top design.
   4. Outlet: 2 inches (51 mm) below top of work surface.

2.14 LABORATORY SERVICE FITTINGS

A. Manufacturers:
   1. Basis of Design: WaterSaver Faucet Company: www.wsflab.com.
   2. Broen Corporation: www.broen.com.
   3. Chicago Faucet Company: www.chicagofaucets.com

B. General Requirements:
   1. Provide fittings comply with SEFA 7.
   2. Provide fittings complete with washers, locknuts, wall flanges, deck flanges, escutcheons, and other installation accessories.

C. Materials:
   1. Water and Gas Fittings: Cast or forged red brass containing minimum 85 percent copper.
   2. Pure Water Fittings: Brass body with polypropylene interior lining.

D. Design and Finishes: Forged brass, 4-arm style handle; Finish: Clear Epoxy over satin chrome. Unless noted otherwise in the Service Fittings Schedule.

E. Service Indexes Color and Identification Code: Per SEFA standard and as listed below:
   1. Cold Water Color: Dark green; Code: CW
   2. Hot Water Color: Red; Code: HW
   3. Air (Compress air) Color: Orange; Code: Air
   4. Gas (Burning) Color: Dark Blue; Code: Gas
   5. Purified Water Color: White; Code: DW, DI
   6. Oxygen Color: Light green; Code: OXY, O2
   7. Nitrogen Color: Gray; Code: N, N2
   8. Carbon Dioxide Color: Light Blue; Code: CO2

F. Fabrication:
   1. Water Service Fittings (Faucets and valves):

a. Equipped with renewable compression valve unit or cartridge containing all working components subject to wear, including replaceable seat and integral volume control device.
b. Capable of being converted from compression to self-closing type.
c. Gooseneck: Separate brazed coupling outlet for attachment of aerator, serrated hose end and other outlet fittings.
d. Vacuum Breaker:
1) Where required and indicated, shall be integral with gooseneck.
2) Equipped with renewable seat and valve designed for fine flow control.
e. Meet requirements of ASME A112.18.1.

2. Pure Water Service Fittings: Faucet has exterior brass casing and interior lining of inert polypropylene or pure Tin. Pure water comes in contact only with inert plastic or pure tin.
3. Dry Service Fittings (Air, Gas, Nitrogen and Special Gas):
a. Needle Control Valves:
1) Valve: Shall have stainless steel or monel metal renewable, self-centering, floating cone and replaceable seat.
2) Body: Shall have removable serrated hose end.
b. Ball Valves:
1) Valve: Chrome plated ball and PTFE seals.
2) Handle: Black nylon, lever type with colored service index button.

G. Service Fittings Schedule:
1. HCW-2: Hot/Cold Water Mixing Faucet, Deck Mounted.
a. Features: 8 inch spread, rigid/swing gooseneck, vacuum breaker; aerator; wrist blade handle. Install as rigid gooseneck. Provide Owner with the nylon spacers for conversion to swing gooseneck for each faucet.
b. Model: Watersaver L2224VB-8-55-BH-WSA.
2. CW-1: Cold Water Connection, Wall Mounted.
a. Hard connection to equipment. Refer to Plumbing. Connection provided by Division 22.
3. CW-7: Cold Water Hose Bib, Wall Mounted.
a. Refer to Plumbing. Fixture provided by Division 22.
4. PW-1: Pure Water Ball Valve and Capped Pipe for Polishing Stations, Wall Mounted.
a. Refer to Plumbing. Valve provided by Division 22.
5. EW-2: Dual Purpose Eye Wash/Drench Hose, Deck Mounted.
a. Features: 2 spray heads side by side, angled at 45 degrees. Squeeze handle with locking clip, hose guide and backflow preventer. Include safety sign.
b. Model: Watersaver EW1022-BP.
6. EW-3: Eye Wash, Deck Mounted.
a. Features: 2 spray heads side by side. Swiveling armature assembly with flag handle operator and backflow preventer. Include safety sign.
b. Model: WaterSaver EW893-BP.
7. EW-4: Dual Purpose Eye Wash/Drench Hose, Panel Mounted.
a. Features: 2 spray heads side-by-side. Squeeze handle with locking clip, in-line vacuum breaker, hose guide and backflow preventer. Include safety sign.
b. Model: Watersaver EW-1026-VB.
8. A-1, CO2-1, G-1, N2-1, O2-1: Air, Carbon Dioxide, Gas, Nitrogen and Oxygen Single Ball Valves, Wall Mounted Straight Pattern.
a. Feature: Wall mounted turret base. Ball valve, straight pattern with serrated hose end and lever handle.
b. Model: WaterSaver L4200-158FT.
9. A-2: Air Single Ball Valves, Deck Mounted Straight Pattern.
a. Feature: Deck mounted turret base. Ball valve, straight pattern with serrated hose end and lever handle.
b. Model: WaterSaver L4200-131.

10. A-3, G-3, V-3: Air, Gas & Vacuum Double Ball Valves at 90 degrees, Movable Bench Upright Support Bench Mounted.
    a. Feature: Straight pattern, removable, serrated hose end and lever handles.
    b. Model: WaterSaver: L4200-141.
11. A-4: Air, Quick Connect Assembly for Ceiling Service Panels and Overhead Service Carriers. Provides services to benches or tables below.
    a. Feature: Stainless steel fittings for natural gas, nickel plated brass for all other dry services.
    b. Components:
        1) Nipple and bulkhead coupler, each wtih color-keyed band to identify service.
        2) Union fitting (3/8" to 3/8") for tube ends at top of movable modular bench uprights.
    c. Model: Casework manufacturer's standard.
12. A-5, G-5: Air and Natural Gas, Single Needle Valve, Panel Mounted at Fume Hood.
    a. Feature: Remote control needle valve assembly, angle pattern with removable serrated hose end. Cylinder Gases (CGx) where "x" denotes cylinder gases as noted on the drawings.
    b. Model: WaterSaver L740N-L022.
    c. Fume hood fitting finish to be powder coated finish color-coded per service index color. Handle to be 4-arm style handle, clear epoxy over satin chrome finish.
13. A-5a, NG-5a: Air and Natural Gas, Single Needle Valve, Panel Mounted at Fume Hood. Cylinder Gases (CGx) where "x" denotes cylinder gases as noted on the drawings.
    a. Feature: Remote control needle valve assembly, angle pattern with removable serrated hose end and lever handles.
    b. Model: WaterSaver L4285-L022.
    c. Fume hood fitting finish to be powder coated finish color-coded per service index color. Handle to be 4-arm style handle, clear epoxy over satin chrome.

2.15 EMERGENCY SHOWERS

A. Manufacturers:
    1. Basis of Design: WaterSaver Faucet Company: www.wsflab.com.
    2. Broen Corporation: www.broen.com.
    3. Chicago Faucet Company: www.chicagofaucets.com

B. ES-1: Emergency Shower and Eye Wash Combination, Recessed Mounted.
    1. Feature: Ceiling mounted exposed brushed stainless steel shower head, pipe and escutcheon plate, recessed panic bar activation for safety shower. Pull down activation and drain pan for eye wash. Recessed stainless steel cabinet. Barrier free compliant. Include safety sign.
    2. Model: WaterSaver SSBF2150.

C. ES-2: Emergency Shower, Recessed Mounted.
    1. Feature: Ceiling mounted exposed brushed stainless steel shower head, pipe and escutcheon plate, recessed panic bar activation. Barrier free compliant. Include safety sign.
    2. Model: WaterSaver ESBF670.

2.16 CEILING SERVICE PANEL (CSP)

A. Powder coated steel ceiling service panel. Panel shall be furnished complete with junction boxes, outlets, quick-connect fittings, flexible piping and cabling, and all other components required to bring indicated services to the Movable Bench System or Laboratory Tables. Service panels shall be designed to integrate within a standard 15/16" wide ceiling suspension system grid. Provide additional support/bracing as needed to support ceiling service tiles. Tiles should not be supported by ceiling grid alone.

B. Construction: Minimum 18 gauge cold rolled steel with urethane powder coat finish.

C. Color: White

D. Nominal Dimensions:
   1. Height (including electrical junction boxes): 3 inches.
   2. Width: As indicated on Laboratory drawings.

E. Electrical Power Devices: Factory provided. UL labeled.
   1. Refer to Laboratory details for receptacle identification (NEMA configuration).
      a. Typical locations: Twist lock, flush receptacles. Color: Black.
      b. Receptacles on Emergency power location: Twist lock, flush receptacles. Color: Red.
   2. Cover plates: Metal, powder coated finish color white, with formed, beveled edges.

F. Plumbing Service Fixtures:
   1. Ceiling Utility Panel system shall include locking, color-coded keyed quick-connect fittings for each service indicated. Each quick-connect shall include nipple and coupler with color-keyed band marking media.
   2. Refer to Laboratory details for required plumbing services.

G. Plumbing Service Lines: Provided for connection of services from the ceiling service panel to the top of rear support frame of the movable bench systems, laboratory tables, laboratory equipment or adjacent vertical utility chase. Coordinate length of lines as required per bench and ceiling service panel locations shown on drawings (architect to approve length prior to installation - should not have more length than required to reach ceiling service panel). Service lines to include keyed quick connect fittings.
   1. Air, Vacuum and other Non-burning Gases: Reinforced PVC hose; Color: White.
   2. Natural and Reactive Gases: Braided stainless steel hose.
   3. Water: Reinforced PVC hose.
   4. Cooling Water: Color Coded Reinforced PVC hose.
   5. Length:
      a. At movable bench system to ceiling service panel locations: 60 inch length.
      b. At laboratory table to ceiling service panel locations: 96 inches.
      c. At movable bench system to vertical utility chase locations: 36 in length.
   6. Hoses to include keyed quick connect fittings.
   7. Provide an additional 10 drop cords.

H. Blank Plates: Provide cover plates, metal, powder coated finish color white, at all electrical cut-outs where services are not required. Provide knock-outs of same finish as panel where plumbing services are not required. Provide plugs for all knock-out locations.

I. Data cut out locations: Refer to Laboratory details for locations. Provide cover plates, metal, powder coated finish color white for all unused cut outs. Data outlets installed by Owner.

J. Coordinate pre-piping and wiring as required with Contractor. Shop Drawings shall clearly show all services to be provided at each panel location.

K. Installation of services:
   1. Junction boxes for electrical and telecommunications services: All junction boxes shall be factory attached.
   2. All service fixtures shall be provided by the laboratory casework manufacturer and be factory installed.
   3. All electrical outlets shall be provided by and installed by Division 26. Cover plates shall be factory or field installed as approved by the Contractor. Coordinate installation with Contractor.
   4. Telecommunications outlets and all electrical and low voltage wiring shall be provided by and installed by Owner. Coordinate installation with Contractor.

L. Power Cord and Plumbing Service Line Management: Plumbing lines, power cords and cabling from ceiling service panels to modular movable bench systems, laboratory tables and equipment shall be concealed by a removable flexible plastic shroud/wrap with hook and loop closure.
   1. Basis of Design: Techflex, Flexo Wrap. Color: White.

2.17 OVERHEAD SERVICE CARRIER (OSC)

A. Custom Fabricated Overhead Service Carrier: horizontal formed metal service chase suspended from slotted channel framing mounted above ceiling.
   1. Manufacturers:
      a. Bedcolab Ltd.
      b. Kewaunee Scientific Corporation.
      c. Mott Manufacturing Ltd.
   2. Basis-of-Design Product: Subject to compliance with requirements, provide Mott Manufacturing Ltd.; Avion Overhead Service Carrier. Comparable products may be provided by Manufacturers listed above.
   3. Size:
      a. Service Carrier: 72 inches wide by 22 inches deep x 6 inches high.
      b. Vertical Upright Posts: Height as indicated.
   4. Components:
      a. Structural support components:
         1) Vertical Upright Posts: Manufacturer's framing members housing plumbing, electrical and data services, wrapped in finished sheet steel.
            (a) Steel: 0.0598 inch cold-rolled steel.
            (b) Unistrut support framing: 15/16 inch x 1 7/8 inch, extending 18 inches above ceiling height.
         2) Carrier Body: Enclosed horizontal chase for services clad in finished sheet steel.
            (a) Provide access covers at top of carrier body coordinated with service valves.
            (b) Bracket: 0.0747-inch cold-rolled steel sheet.
            (c) Provide attachment brackets with positioners for conduit and piping.
         3) Service cutouts: Factory-cut.
      b. Connect Overhead Service Carrier to be Unistrut as shown in Laboratory Drawings. Structure to support 100 lbs per linear foot of shelving. Provide diagonal bracing above ceiling plane to resist a 100 plf load applied horizontally at the base of the assembly in any direction.
      c. Provide power as shown on Laboratory and Electrical Drawings. Factory punch service ports.
      d. Provide plumbing service fixtures as shown on Laboratory Drawings. Factory punch service ports.
   5. Finish: All exposed metal surfaces, including framing members, to be acid-resistant, epoxy powder coated paint. Color to match metal casework.
   6. Manufacturer to coordinate with others trades for mounting of carrier to structure above.
   7. Manufacturer to provide service valves and piping to 6" above ceiling. Final connections by Division 22 and Division 26. Piping to match material indicated in Plumbing and HVAC Drawings. Exposed piping to be finished to match service carrier.

2.18 ELECTRICAL FITTINGS

A. Wall mounted power and data raceways, and wall recessed power and data receptacles in the laboratories: Refer to Electrical and Data/Communications drawings and specifications.

B. Power receptacles at modular movable bench systems, ceiling service panels, and deck mounted pedestal boxes: Provided by Laboratory Casework manufacturer.

C. General:
   1. All electrical fittings shall be UL labeled.
   2. Provide ground-fault circuit interrupters (GFCI) for fittings where indicated and when located in units containing water supplies or sinks.
   3. Provide:
      a. Standard terminals.
         1) Switches.
         2) Pilot lights.

3) Device plates.
4) Fittings and gaskets for mounting electrical fittings.

4. Finishes:
   a. Housings or boxes for pedestal-type and line-type fittings: Manufacturer's standard finish.
   b. Painted surfaces:
      1) Baked-on, chemical resistant enamel.
      2) Color: _____.
   c. Ferrous fittings: Galvanized finish.
   d. Receptacle and switch cores: Black.

D. Deck Mounted Electrical Pedestal Boxes:
   1. Type PD-2:
      a. Style: Double wide, double faced box.
   2. Type PD-3.
      a. Style: Double wide, single faced box. Quad outlets
   3. Finish:
      a. Satin aluminum with clear epoxy coating.
      b. Receptacle and switch cores: Gray.
   4. Locations indicated on drawings.

E. Switches:
   1. Switches: Single pole, double pole, or 3-way switches, as required, rated 120-277 volts AC, and in amperage capacities to suit units served.
   2. DC switches: Single pole or double pole, as required, rated 125-250 volts DC, and in amperage capacities to suit units served.
   3. Switch Color: Match receptacles.
   4. Thermal overload switches: Single pole or double pole, as required, with maximum over-current trip setting to suit particular motor controlled.

F. Cover plates:
   1. AC outlets and devices:
      a. Type 302 stainless steel, No. 4 satin finish, with formed, beveled edges.
      b. Etched stainless steel: Etch directly on plate. Fill etched letters on cover plates with black enamel.
   2. DC or combination AC/DC outlets and devices:
      a. Laminated plastic.
      b. Etch laminated plastic strips to provide white lettering on black background.
      c. Securely fasten to cover plate with non-corrosive fasteners or epoxy adhesive.

G. Cover Plate Identification:
   1. Provide identification at receptacles, switches, terminal posts, and other locations as indicated.
   2. Letters: 1/4-inch-high letters, non-serif font.
   3. Identify the following devices:
      a. AC receptacles, other than standard 125 volt duplex, grounding type. Indicate voltage and phase.
      b. Switches and thermal overload switches. Indicate equipment being controlled (e.g., "FUME HOOD FAN").

2.19 HEAVY DUTY SHELVING

A. Basis of Design: METRO, MetroMax i Polymer Storage System with MetroMax i Polymer Shelves.

B. Dimensions: As indicated on Laboratory drawings.

C. Features:
   1. Post: Corrosion proof, plastic/polymer construction with nylon adjustable leveling foot.
      a. Height as indicated on drawings.

2. Shelves: Adjustable in 1 inch increments. Quantity as indicated on drawings.
   a. Open grid shelf.
   b. Solid solid plastic/polymer shelf.
   c. Heavy duty dunnage shelf.
3. Weight capacity:
   a. Open grid shelf: 800 lb capacity per shelf.
   b. Solid solid plastic/polymer shelf: 800 lb capacity per shelf.
   c. Heavy duty dunnage shelf: 1200 lb capacity per shelf.
4. Stem Casters: Where noted on drawings.
   a. 900 llb rating per caster.
   b. Include rubber bumpers.
   c. 2-qty swivel and 2-qty swivel brake casters.

2.20 FUME EXTRACTION DEVICES (FED):

A. Description: Fume Extraction Device for welding area fume removal. Coordinate installation with Owner-furnished, Owner-installed welding equipment.

B. Manufacturers:
   1. Alsident System: www.alsident.com.
   2. Nederman, Inc.: www.nedermanusa.com.
   3. Fumex/Movex: www.fumex.com. www.movexinc.com.

C. Basis-of-Design Model: Subject to compliance with requirements, provide Movex PRX White. Comparable products may be provided by the manufacturers listed above.

D. Exhaust Rate: 200 CFM.

E. Mounting: Structure-mounted with side exhaust duct connection.

F. Articulating Extractor Arm:
   1. Chemical resistant aluminum tube.
   2. Total Length: Not less than 14 feet.
   3. Diameter: Not less than 6 inches.

G. Hood:
   1. Manufacturer's standard aluminum hood.
   2. Diameter: Not less than 14 inches.

H. Damper:
   1. Design: Allow fume extractor devices installed in a central system to be turned on or off.
   2. Blade Material: Manufacturer's standard.

I. Balancing Valve: Locate above ceiling.

J. Mounting Accessories:
   1. Provide framing support of ceiling column as required. Refer to Laboratory drawings.
   2. Provide ceiling trim / escutcheon plate at suspended ceiling panel. Color: White.

2.21 ACCESSORIES

A. Pegboard/Drying Rack (PB):
   1. Cast Epoxy Pegboard:
      a. Pegboard:
         1) Material: 1 inch thick cast epoxy resin.
         2) Color: To match work surface.
         3) One-piece body with 2 inch stainless drip trough.
      b. Size: As indicated on Laboratory drawings.
      c. Pegs: Removable 1/2 inch diameter, 6 inches long, black polypropylene. Mounted 30-degee.
         1) All rows: 6 inch long pegs.
      d. Drip trough shall have drain tube connector.
      e. Provide each wall mounted unit with wall hanger and stabilizer bracket kit.

f. Accessories: PVC drain tube to sink.

B. Task Light:
1. Products:
a. Basis of Design: Light Corp: REED PREMIER Standard Output.
b. Tresco Lighting: Eurolinx.
c. Workrite Ergonomics: Ciglio 2.
2. Features:
a. Provide minimum 6.6 watt LED task light with switched on/off and Occupancy Sensor.
b. Power: 120V with power supply integral to cord or fixture.
c. Dimmable: Range from 15% to 100%.
d. Color temperature: 3000-3500k.
e. Auto OFF at 10 hours.
f. Length:
1) Nominal 16 inches for use at 24 to 36-inch shelves.
2) Nominal 30 inches for use at 42 to 48-inch shelves.
g. Finish: Clear anodized.
3. Mounting: Fixed to the underside of the bottom shelf with magnetic attachment, location as indicated on Laboratory drawings.
4. Provide one light at all adjustable shelving locations: Movable bench system and fixed casework locations.
5. Configuration: Provide task lights at each shelf above casework, including fixed casework, lab table and movable bench systems. At all wall shelving locations provide jumper cord to connect fixtures into a daisy chain arrangement to operate on a single transformer. At movable bench system locations the two task lights per side of bench shall be connected together with a jumper cord to operate on a single transformer.
6. Provide cord management clips and devices for power cord and transformer.
7. Task lights at wall mounted adjustable shelving shall match task lights provided at modular movable bench systems.

C. Cylinder Wall Bracket (CR): Refer to Laboratory Casework Menu Legend for types.
1. Manufacturers:
a. USA Safety: www.usasafety.com
b. Global Industries: www.globalindustrial.com.
c. Vestil: www.vestilmfg.com.
2. Basis of Design: USA Safety
a. CR-2: 2 Cylinder Bracket: Model #GB200FS
3. Dimensions: As indicated on Laboratory Casework drawings.
4. Components.
a. 4 inch epoxy powder coated steel with non-marring edge guards.
b. Heavy duty strap and non-slip steel safety buckle for each cylinder.
c. Adjustable to fit cylinder from 4 to 12 inch diameter.
5. Wall mounted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Floors shall be level to within 1/4 inch (6.4 mm) in 10 feet (0.9 m), noncumulative, in any one direction.

B. Final floor finish shall be completed prior to casework installation. See Sequencing Article in Part 1.

C. Wall systems shall be completely installed and be plumb for installation of wall cabinets. Install all blocking and supports for wall cabinets. Wall system finish shall be complete including final painting.

D. The ceiling system shall be in place including suspension grid and ceiling panels except at fume hoods and utility umbilical drops at island benches.

E. The ceiling system shall be in place including finishes of gypsum board.

F. Branch electrical circuits, including grounding conductors, shall be in place.

G. HVAC grilles, call systems, and sprinkler heads shall be installed.

H. Overhead electrical fixtures shall be installed and connected. Provide adequate lighting for installation of casework.

I. Overhead mechanical lines shall be tested for leaks before finished casework is installed in any area.

J. Where mechanical, electrical and HVAC service lines will be behind or under casework, service access or stubs shall have been installed at the appropriate rough-in point.

K. Service lines for water, gas, vacuum, and special gases shall be flushed clean of dirt and chips, capped and tested for leaks prior to the connection of service fittings.

L. No standing water shall be evident on the floor. Water producing operations such as masonry, terrazzo, and plaster shall be completed and cured prior to casework installation.

3.02 CASEWORK INSTALLATION

A. Install plumb, level, true and aligned with no distortions. Shim, using concealed shims. Where laboratory casework abuts other finished work, scribe and apply filler strips for accurate fit with fasteners concealed. Fit scribe strips to irregularities of adjacent surfaces. Maximum gap opening shall be 0.025 inch (0.6 mm).

B. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub-tops within 1/16 inch (1.6 mm) of a single plane. Bolt continuous cabinets together. Fasten continuous cabinets to floor at toe space, with fasteners spaced 48 inches (1220 mm) o.c. Secure individual cabinets with not less than two fasteners into floor, where they do not adjoin other cabinets. Assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.6 mm).

C. Wall Cabinets and Shelves: Fasten to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified herein for base cabinets. Reinforcement of stud walls to support wall-mounted cabinets and shelves will be done during wall erection by trade involved, but responsibility for accurate location and sizing of reinforcement is part of this work.

D. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

E. Caulk between casework and wall .

F. Install scheduled wall base as indicated in Sequencing Article in Part 1.

3.03 WORK SURFACE INSTALLATION

A. Field Jointing: Make in same manner as factory jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings, factory prepared so there is no job site processing of top and edge surfaces.

B. Alignment: Abut top and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in work surfaces.

C. Installation Tolerances:
   1. Level: +/- 1/8 inch (3.2 mm) in 10 feet (0.96 m), noncumulative.
   2. Joint widths: 1/16 inch (1.6 mm) maximum wide at any location, flush with abutting edges. Horizontal alignment of top surface of all joints for their entire length shall be 1/32 inch (0.8 mm). Fill joints.
   3. Front edges of all abutting units shall align.
   4. Visible gaps at cutouts with escutcheon or grommet: None.

D. Resin Worksurfaces:

1. Fastening: Secure to cabinets with silicone adhesive applied at each corner and along perimeter edges at not more than 48" o.c. Adhesive, rather than epoxy cement, allows for future disassembly and relocation.
2. Workmanship: Abut top and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in top units using clamping devices.
3. Tolerances: Provide joint widths not more than 1/16" wide at any location, filled and flush with abutting edges. Horizontal alignment of top surface of all joints for their entire length shall be within 1/32". Front edges of all abutting pieces shall align.
4. Surface Finish: After installation, dress joints smooth, remove any surface scratches, clean and polish entire surface.
5. Verify field dimensions and squareness of adjacent walls prior to installation.

3.04 SERVICE FIXTURES AND FITTINGS INSTALLATION

A. Refer to the mechanical Specifications for final connection of plumbing fixtures and fittings.

B. Sinks:
1. Install sinks with integral rim or sink ring, set in mastic or sealant to form a positive seal with the work surface.
2. Remove excess mastic and sealant after sink is set.
3. Apply 1/8 inch (3.2 mm) thick, heat resistant underseal to undersink surfaces to prevent condensation and provide sound deadening.
4. Cast epoxy resin sink installation in resin work surface:
a. Underslung installation:
1) Supports: Steel channels attached to ends of sink cabinet, adjustable by screw type rods.
2) Set top edge of sink tight to underside of work surface, in chemical resistant sealing compound, for a tight and leak proof joint.
3) Adjust sink and support to prevent movement.
4) Remove excess sealing compound after sink is set.

3.05 ACCESSORY INSTALLATION

A. Install in a precise manner in accordance with manufacturer's directions.

B. Turn screws to a flat seat; do not drive.

C. Adjust moving parts to operate freely without excessive bind.

3.06 INTERFACE WITH OTHER WORK

A. Where access is required through items of laboratory casework, remove access panels, drawers, and other components, where they occur; make connections; and replace components.

B. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

3.07 ADJUSTING

A. Adjust hardware and fittings for smooth operation.

3.08 CLEANING AND PROTECTION

A. Clean shop-finished surfaces, touch-up and remove or refinish damaged or soiled areas, as acceptable to the Architect.

B. Clean and polish epoxy resin countertops.

C. Protection: Protect materials and installed laboratory casework and fixtures from subsequent construction operations.

D. Laboratory casework and counters are not to be used as workbenches or work platforms for any portion of the work by any trade. Furniture and casework, as installed, is considered to be finished equipment and shall be protected from damage.

E. Repair or remove and replace defective work as directed by the Architect upon completion of installation.

END OF SECTION

SECTION 12 36 00 - COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic Laminate Countertops.

B. Plastic Laminate Countertops with Top Mounted Sinks.

C. Solid Surface Countertops.

D. Solid Surface Countertops with Integral Sinks.

E. Quartz Surface Countertops.

1.02 REFERENCES

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ANSI Z124.3 - American National Standard for Plastic Lavatories; 2005.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. PS 1 - Structural Plywood; 2009 (Revised 2019).

1.03 SUBMITTALS

A. Product Data: Provide data on specified component products.

B. Samples: Submit two samples of countertop, 2 x 2 x 1/2 inches (51 x 51 x 13 mm) in size, illustrating color, texture, and finish.

C. Shop Drawings: Indicate dimensions, thicknesses, backsplashes, sidesplashes, required clearances, materials, colors, finishes, field jointing, adjacent construction, design load parameters, methods of support, and anchorages.
   1. Indicate integration of plumbing components.

D. Manufacturer's Installation Instructions.
   1. Indicate preparation of opening required.

E. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to component materials.
   1. Include instructions for stain removal, surface and gloss restoration.

1.04 QUALITY ASSURANCE

A. Fabricator: Manufacturer's authorized fabricator.

1.05 PROJECT CONDITIONS

A. Verify that field measurements are as indicated.

B. Sequence Work to permit installation of plumbing rough-in.

PART 2 PRODUCTS

2.01 ENVIRONMENTAL REQUIREMENTS

A. Indoor Environmental Quality - Low-Emitting Materials - Adhesives and Sealants.
   1. Multipurpose Construction Adhesives: not more than 70 g/l.

2.02 LAMINATE MATERIALS

A. Plastic Laminate Manufacturers:
   1. Nevamar: www.nevamar.com.
   2. Panolam Industries: www.panolam.com/pionite.
   3. WilsonArt International: www.wilsonart.com.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:

1. Exposed Surfaces: HGS, 0.048 inch (1.2 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
2. Laminate Backer: BKL, 0.020 inch (0.5 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

C. Color: As scheduled in Section 06 41 00.

D. Edge Material:
1. Laminate: Same as material specified above.
2. Color: As scheduled, or as selected by the Architect from manufacturer's full range.

E. Substrate: One of the following:
1. Particleboard: ANSI A208.1; medium density industrial type, composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.
2. Formaldehyde Free Medium Density Fiberboard (MDF): ANSI A208.2 ; composed of wood fibers pressure bonded with moisture resistant adhesive with no added formaldehyde, to suit application; sanded faces; thickness as required.

F. Substrate Formaldehyde:
1. Panel materials shall comply with California Green Building Materials Table 5.504.4.5 requirements for formaldehyde emission limits measured in accordance with California Air Resources Board, Air Toxics Control Measure for Composite Wood when tested in accordance sith ASTM E1333.
a. Hardwood plywood - veneer core or composite core: 0.05 ppm.
b. Particleboard: 0.09 ppm.
c. Medium density fiberboard (MDF): 0.11 pp.
d. Thin medium density fiberboard - not exceeding 1/16 inch or 8 mm: 0.13 ppm.
2. Panel products shall either be labeled and invoiced as meeting the Composite Wood Products regulation (CCR Title 17 Section 93120 et seq) or shall be accompanied by a chain of custody certification or shall be labeled and comply with PS-1 or PS-2 or Australian AS/NZS 2260 or European 636 3S.

2.03 SOLID SURFACE MATERIAL (SOC)

A. Manufacturers:
1. Basis of Design: Wilsonart International.
a. Color 1 (SOC1): Peace Grey 9232SS.
b. Color 2 (SOC2): Saharan Night 9225SS.
2. Acceptable alternate products:
a. Color 1 (SOC1):
1) Formica Corporation; Ashen Concrete 607.
2) Hanex; Merino Grey B-036.
b. Color 2 (SOC2):
1) Corian; Deep Espresso.
2) Meganite; Jet Black 019A.

B. Solid Surface Sheet: Non-porous blend of polyester or acrylic alloys and fillers.
1. Comply with ISFA 2-01.
2. Capable of being worked and repaired using standard woodworking tools.
3. No surface coating. Color and pattern consistent throughout thickness.

C. Flat Sheet Thickness: 1/2 inch (13 mm) sheet thickness. Provide total thickness indicated on drawings.

D. Color: As scheduled, or as selected by the Architect from manufacturer's full range.

E. Joint Adhesive: Manufacturer's standard adhesive to create invisible, nonporous joints with a chemical bond.

F. Integral Sinks: Integral castings, not less than 3/4 inch (19 mm) thickness. Comply with ANSI Z124.3.

1. Wilsonart International; #AV1812, Rectangle ADA Vanity: 19-1/2"L x 14-5/16"W x 5"D.
   a. Color: Clean White.

G. Supporting Substrate: Plywood, PS 1 Exterior Type, AC veneer grade, minimum 5-ply; not less than 3/4 inch (19 mm) thick.
   1. Join lengths using metal splines.
   2. Provide cutouts in plywood for heat release as required by manufacturer.

2.04 QUARTZ SURFACE MATERIAL (QC)

A. Products:
   1. Basis of Design: WIlsonart International; Q4041, Enchanted Rock.
   2. Cambria USA; Mammoth Cave.
   3. Corian; Portoro.

B. Quartz Sheet: Homogeneous quartz and resin matrix.

C. Thickness: 3 cm (1-3/16" nominal) sheet thickness. Provide total thickness and profile indicated on drawings.

D. Finish: Polished.

E. Joint Adhesive: Manufacturer's standard two-part epoxy, polyester, or acrylic adhesive to create color matched, nonporous joints, with a chemical bond.

F. Panel Adhesive: Manufacturer's structural silicone adhesive.

G. Sealant: Mildew resistant silicone sealant specified in Section 07 92 00.
   1. Color: Match quartz surface.

2.05 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

B. Edge Detail: As indicated on drawings.

C. Provide holes and cutouts for plumbing accessories as indicated on shop drawings.

D. Plastic Laminate:
   1. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.
   2. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   3. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
   4. Locate counter butt joints minimum 2 feet (610 mm) from sink cut-outs.
   5. Provide cutouts for plumbing fixtures. Prime paint cut edges.
   6. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Solid Surface:
   1. Form joints between components using manufacturer’s standard joint adhesive. Joints shall be invisible in appearance and without voids. Attach 4 inches (102 mm) wide reinforcing strip under joints as required by manufacturer.
   2. Rout and finish component edges to a smooth, uniform finish.
   3. Rout cutouts then sand edges smooth.
   4. Install integral sink bowls in countertops in shop.

F. Quartz Surfaces:
   1. Form joints between components using manufacturer’s standard joint adhesive. Provide joints no greater than 1/8 inch (3 mm) wide and without voids. Provide 4 inches (102 mm) wide support along entire seam.
   2. Machine and finish component edges to a smooth, high gloss, uniform finish.
   3. Rout cutouts then finish edges smooth.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates. Identify conditions detrimental to proper or timely installation. Do not commence installation until conditions have been corrected.

3.02 INSTALLATION

A. Install components plumb, level true and straight in accordance with approved shop drawings, project installation details and manufacturer’s printed instructions. Shim as necessary using concealed shims.

B. Provide inconspicuous joints in finished work.

3.03 INSTALLATION - COUNTERTOPS

A. Attach top securely to base unit or support brackets.

B. Provide side splashes where countertops abut vertical walls.

C. Provide back splashes where countertops abut vertical walls.

D. For solid surface backsplashes, provide hard seamed coved backsplash with 1/4 inch (6 mm) radius.

E. Seal between wall and back and side splashes with sealant specified in Section 07 92 00.

F. Adhere undermount sinks to countertop using manufacturer’s recommended adhesive and mounting hardware.

G. Adhere top-mount sinks to countertop using manufacturer’s recommended adhesive or mildew resistant silicone sealant specified in Section 07 92 00.

H. Coordinate plumbing installation with Division 22.

3.04 CLEANING

A. Clean fabrication surfaces in accordance with manufacturer's instructions.

3.05 PROTECTION OF FINISHED WORK

A. Protect surfaces from damage until date of Final Acceptance. Replace damaged components that cannot be repaired to Architect's satisfaction.

B. Review maintenance procedures with Owner's representative upon completion of project.

END OF SECTION

SECTION 14 21 00 - ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric traction elevator systems.

B. Maintenance Contract.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. AISC 360 - Specification for Structural Steel Buildings; 2016 (Revised 2021).

C. ANSI/ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013.

D. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2019, with Errata (2021).

E. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, and Dumbwaiters; 2020.

F. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2021).

L. ITS (DIR) - Directory of Listed Products; current edition.

M. NEMA MG 1 - Motors and Generators; 2018.

N. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Q. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work with other installers to provide necessary conduits for proper installation of wiring, including but not limited to, the following:
   a. Elevator equipment devices remote from elevator machine room or hoistway.
   b. Elevator pit for lighting and sump pump.
   c. Fire alarm panel from controller cabinet.
2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
   a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.

b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation; include provisions for shunt trip power monitoring.

B. Construction Use of Elevator: Elevator may be used for transport of construction personnel and materials in compliance with ASME A17.1.
1. Enclose car with protective plywood on floor, walls, and ceiling.
2. Provide temporary lighting.
3. Provide control panel with manual and emergency operation.

1.04 SUBMITTALS

A. Product Data: Submit data on following items:
1. Signal and operating fixtures, operating panels, and indicators.
2. Car design, dimensions, layout, and components.
3. Car and hoistway door and frame details.
4. Electrical characteristics and connection requirements.

B. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
2. Hoistway Components: Size and location of car machine beams, guide rails, buffers, ropes, and other components.
3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
4. Individual weight of principal components; load reaction at points of support.
5. Loads on hoisting beams.
6. Clearances and over-travel of car and counterweight.
7. Locations in hoistway of traveling cables and connections for car lighting and telephone.
8. Location and sizes of hoistway and car doors and frames.
9. Calculated heat dissipation of elevator equipment in machine room.
10. Interface with building security system.
11. Electrical characteristics and connection requirements.
12. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.

C. Samples: Submit samples illustrating car floor material, car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.

D. Welders Qualification Statement: Welders certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Initial Maintenance Contract.
1. Elevator company installing the elevator to include a one (1) year service agreement to cover services outlined on the WTCC elevator service contract through the 12 month Contractor Guarantee period.

G. Operation and Maintenance Data:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
2. Operation and maintenance manual.
3. Schematic drawings of equipment, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

C. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.06 WARRANTY

A. Provide manufacturer's warranty for elevator operating equipment and devices for two years from Date of Final Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electric Traction Elevators:
   1. Basis of Design: KONE; KONE MonoSpace 500 DX: www.kone.us.
   2. Or comparable products from:
      a. Otis Elevator Company: www.otis.com.
      b. Schindler Elevator Corporation: www.us.schindler.com.
      c. ThyssenKrupp Elevator: www.thyssenkruppelevator.com.

B. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier.

2.02 ELECTRIC TRACTION ELEVATORS

A. Electric Traction Passenger Elevator:
   1. Electric Traction Elevator Equipment:
      a. Gearless Traction Machine: Single wrapped traction driving sheave, with dual brake.
   2. Drive System:
      a. Variable voltage alternating current (AC).
   3. Service Control Types:
      a. Standard service control.
   4. Interior Car Height: 105 inch (2667 mm).
   5. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
   6. Rated Net Capacity: 3500 pounds (1590 kgs).
   7. Rated Speed: 150 feet per minute (0.75 m per second).
   8. Hoistway Size: As indicated on drawings.
   9. Interior Car Platform Size: 77-5/8 inch wide by 66-5/8 inch deep (1972 mm wide by 1692 mm deep).
   10. Elevator Pit Depth: 60 inch (1524 mm).
   11. Overhead Clearance at Top Floor: 168 inch (4267 mm).
   12. Travel Distance: As indicated on drawings.
   13. Number of Stops: As indicated on drawings.
   14. Number of Openings: 3 Front.
   15. Traction Machine Location: Top of hoistway shaft.

B. Electric Traction Service Elevator:
   1. Rated Net Capacity: 4500 lb (2045 kg).
   2. Service Control Types:
      a. Standard service control.
      b. Card-reader operation.

3. Interior Car Height: 105 inch (2667 mm).
4. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
5. Rated Speed: 150 feet per minute (0.75 m per second).
6. Hoistway Size: As indicated on drawings.
7. Interior Car Platform Size: 67-1/8 inch wide by 97-7/8 inch deep (1705 mm wide by 2485 mm deep).
8. Elevator Pit Depth: 60 inch (1524 mm).
9. Overhead Clearance at Top Floor: 176 inch (4470 mm).
10. Travel Distance: As indicated on drawings.
11. Number of Stops: As indicated on drawings.
12. Number of Openings: 4 Front.
13. Traction Machine Location: Top of hoistway shaft.

2.03 COMPONENTS

A. Elevator Equipment:
   1. Motors, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70 requirements, and see Section 26 05 83 for additional information.
   2. Guide Rails, Cables, Counterweights, Sheaves, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
   3. Buffers:
      a. Spring type for elevators with speed less than or equal to 200 feet per minute (1 m per second).
   4. Lubrication Equipment:
      a. Provide grease fittings for periodic lubrication of bearings.
      b. Grease Cups: Automatic feed type.
      c. Lubrication Points: Visible and easily accessible.

B. Electrical Equipment:
   1. Motors: NEMA MG 1.
   2. Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 requirements, and see Division 26 for additional information.
   3. Sump Pump in Pit: See Division 22 for additional information.
   4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
   5. Include wiring and connections to elevator devices remote from hoistway. See Division 26.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, authorities having jurisdiction (AHJ), and ANSI/ASHRAE 90.1.

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Fabricate and install door and frame assemblies in accordance with NFPA 80 and complying with requirements of authorities having jurisdiction (AHJ).

F. Perform electrical work in accordance with NFPA 70.

G. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). See Section 21 13 00.

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide landing operating panels and landing indicator panels.
   1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
   2. Landing Indicator Panels: Combination hall lanterns and hall position indicators mounted above entrance frames.

3. Comply with ADA Standards for elevator controls.

B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, building management control, and VoIP phone systems.

C. Door Operation Controls:
1. Program door control to open doors automatically when car arrives at floor landing.
2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

D. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
1. Designated Landing: At First floor.

E. Card-Reader Operation: System uses card readers at car-control stations and hall push-button stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. Allow space for card reader in car control panel.

2.06 OPERATION CONTROL TYPE

A. Group Automatic Operation Control: Applies to cars in two or more elevator shafts, with microprocessor and multicar operation.
1. Refer to description provided in ASME A17.1.
2. Include group automatic operation controls responsive to variations of traffic demand.
3. Provide system in car so that momentary pressure on one or more of car buttons causes car to start moving in direction of registered call.
4. Allow only one car to stop in response to any one landing call.
5. If a car stops for a landing call, and car button matching direction the car was traveling is pressed within a predetermined time interval after a landing stop, proceed in same direction regardless of other landing calls that are registered.
6. Automatically separate car from group service if it is delayed for predetermined time period, and automatically restore car to group service when delay is corrected.
7. Hold car for a predetermined time interval at landings when stops are made to enable passengers to enter or leave the car.
8. Program system to minimize delays caused by registration of car calls disproportionate to number of persons in car.
9. If a car is removed from service, the other cars shall answer car and landing calls.
10. When car, without registered car calls, arrives at floor landing where both up and down calls are registered, initially respond to landing call in direction of travel.
a. If no car or landing call is registered for future travel in that direction, respond to landing call in opposite direction.
11. Operate landing lanterns to correspond with next direction of travel, and when responding to landing call, operate landing lantern to match direction of call being answered.
12. Program door operating sequence to minimize car and landing door open and close time periods.
13. Include independent service control where indicated, as follows:
a. Provide a switch in the car control cabinet to allow removal of a designated car from group service; car to operate in response to car calls only.
b. Doors open automatically upon arrival at landing.
c. Set landing indicator panels as inoperative when in independent service mode.

2.07 EMERGENCY POWER

A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.

C. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.08 MATERIALS

A. Stainless Steel Sheet: ASTM A666, Type 304; No. 4 Brushed finish unless otherwise indicated.

B. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

C. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

D. Resilient Flooring: Resilient flooring, see Section 09 65 00.

2.09 CAR AND HOISTWAY ENTRANCES

A. Elevator, No. A:
1. Car and Hoistway Entrances:
a. Hoistway Fire Rating: 1 Hour.
b. Elevator Door Fire Rating: 1 Hour.
c. Framed Opening Finish and Material: Brushed stainless steel.
d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
f. Door Operation: Side opening, single speed.
g. Door Width: 42 inch (1.067 m).
h. Door Height: 96 inch (2.438 m).
i. Sills: Extruded aluminum.

B. Elevator, No. B:
1. Car and Hoistway Entrances:
a. Hoistway Fire Rating: 1 Hour.
b. Elevator Door Fire Rating: 1 Hour.
c. Framed Opening Finish and Material: Brushed stainless steel.
d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
f. Door Operation: Side opening, two speed.
g. Door Width: 48 inch (1.219 m).
h. Door Height: 96 inch (2.438 m).
i. Sills: Extruded aluminum.

C. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

2.10 CAR EQUIPMENT AND MATERIALS

A. Elevator Car:
1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, and alarm button.
a. Panel Material: Stainless steel; one per car.
b. Car Floor Position Indicator: Above car operating panel with illuminating position indicators.
c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch (1372 mm) above car finished floor.
d. Provide following as part of car operating panel:
1) Two-way communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use.
2) Telephone jack for firefighters' two-way telephone communication service.

3) Card reader (Service elevator)

2. Ventilation: Single speed fan with grille in ceiling.
3. Flooring: As indicated in Drawings.
4. Wall Base: Recessed stainless steel, 4 inch (102 mm) high.
5. Front Return Panel: Match material of car door.
6. Door Wall: Stainless steel.
7. Side Walls: Stainless steel.
8. Rear Wall: Stainless steel.
9. Hand Rail: Stainless steel, at three side walls. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
   a. Basis of Design: KONE HR61 4SS.
   b. Round, Metal Tube: 1-1/2 inch (38 mm) diameter.
   c. Stainless Steel Finish: No. 4 Brushed.
10. Ceiling:
    a. Basis of Design: KONE CL88 4SS.
    b. Canopy Ceiling: Stainless steel.
    c. Lighting: Round LED spotlights.

B. Car Accessories:
   1. Certificate Frame: Stainless steel frame glazed with clear tempered glass, and attached with tamper-proof screws.
   2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1; brass grommets for supports, covering side and rear walls and front return, with cut-out for control panel; provide one set for each elevator.
      a. Color: Tan.
      b. Provide at least 4 inch (102 mm) clearance from bottom of pad to finished floor.
      c. Pad Supports: Stainless steel studs, and mounted from ceiling frame.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate this work with installation of hoistway wall construction.

B. Install system components, and connect equipment to building utilities.

C. Provide conduit, electrical boxes, wiring, and accessories as specified in Division 26.

D. Mount machines and motors on vibration and acoustic isolators.
   1. Place on structural supports and bearing plates.
   2. Securely fasten to building supports.
   3. Prevent lateral displacement.

E. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

F. Install guide rails to allow for expansion and contraction movement of guide rails.

G. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

H. Bolt or weld brackets directly to structural steel hoistway framing.

I. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime with two coats.

J. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

K. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime with two coats.

L. Adjust equipment for smooth and quiet operation.

3.02 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.03 FIELD QUALITY CONTROL

A. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1 will be performed at their discretion.
   1. Schedule tests with agencies and notify Owner and Architect.
   2. Obtain permits as required to perform tests.
   3. Document regulatory agency tests and inspections in accordance with requirements.
   4. Perform tests required by regulatory agencies.
   5. Furnish test and approval certificates issued by authorities having jurisdiction (AHJ).

3.04 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch (6.4 mm) maximum from flush with sill.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, cleaning and maintenance of each component.

B. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site, unless otherwise indicated.

3.06 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until date of Final Acceptance.

C. Touch-up, repair, or replace damaged products and materials before Date of Final Acceptance.

3.07 MAINTENANCE

A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for twelve months from Date of Final Acceptance.

B. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or installer.

C. Examine system components monthly.

D. Include systematic examination, adjustment, and lubrication of elevator equipment.

E. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

F. Perform work without removing cars from use during peak traffic periods.

G. Provide emergency call back service for 24 hours a day/7 days a week throughout period of this maintenance contract.

H. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION